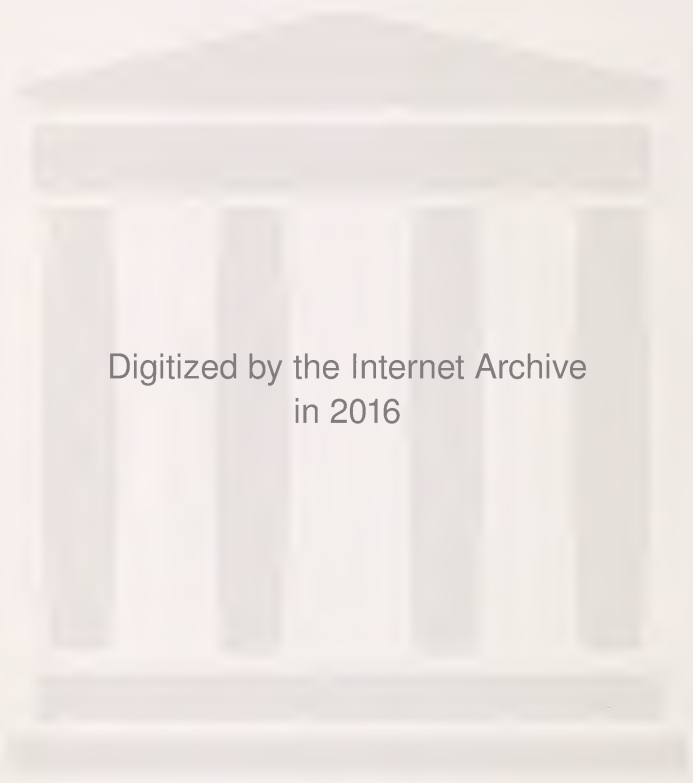


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The American Annual of Photography 1922

VOLUME XXXVI

Edited by Percy Y. Howe



NEW YORK

THE AMERICAN ANNUAL OF PHOTOGRAPHY, INC.

MCMXXI

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NEW YORK.

PREFACE



THE industrial world, due to re-action from war conditions, has been greatly disturbed during the present year, consequently we are unable to report any remarkable advance in the photographic art.

The contributed articles and illustrations in this, our thirty-sixth volume, are by leading workers, both amateur and professional, at home and abroad. The variety of subjects, and individuality of treatment, demonstrate the wide field now covered by photography, and we hope will be of great interest to our readers.

I wish to thank all who have assisted in the preparation of this book, especially those whose contributions we have been compelled to omit through lack of space.

Material for the 1923 edition should be sent to 422 Park Hill Avenue, Yonkers, N. Y., prior to August 1st, 1922.

PERCY Y. HOWE, Editor.

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1923

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William Shewell Ellis.

The American Annual of Photography .. 1922

THE YEAR'S WORK

By CARROL B. NEBLETTE

HE growth of photography has been rapid indeed. When we compare the many forward steps that have taken place, the many processes that have come and gone giving way to methods of superior results and wider applications, and then think that all of this progress has been accomplished in somewhat less than a century, it seems certain that photography is something that the world needs and something that has a large future. For only those discoveries or inventions have such rapid progress which fulfill some urgent world demand, and whatever the world demands must have a future.

Probably no other discovery excepting the invention of printing, and the reduction of metals from their ores, has contributed so much to the advancement of mankind. Photography undoubtedly fills a large and increasing place in the modern world, and of its future few will care to question that it will be of even greater value than it now is. After the thought of the many advances that have been made in the past in the science of photography, the next question that comes to the mind is "What progress is being made now?" To answer this query in a short and popular manner is the purpose of this article.

Owing to the disturbances in the industrial world during the past year the novelties in apparatus have been few. Notable among the new apparatus introduced in the past year has been the Imperial Impex plate for X-Ray workers, the

Carbine film developing tank, and among the new working methods the Dye Impression process, and the new developer D50. As a brief account of these will be of interest I append a short outline of the methods, and a description of the apparatus.

The Imperial Impex plate for X-Ray workers should greatly advance the growing interest that is being taken in this line of work, as it will greatly facilitate the photographing of very difficult subjects. This plate consists of a fast X-Ray emulsion coated on the surface with an intensifying screen composed principally of calcium tungstate. The phospherence property of the layer in close contact with the emulsion has the effect of shortening the required exposure to a considerable degree. Experiment has shown that the new plate is from fifteen to thirty times the speed of the regular X-Ray plate depending on the manner the new plate is used. Owing to the greater speed of the new plate shorter exposures may be given which will enable the worker to attempt muscular movement which has heretofore been attended with great danger to the patient and the operator. The new plate met with the approval of the principal workers in England, and is rapidly making a name for itself.

The Carbine film tank which was introduced by the firm of Butcher & Sons, of London differs from the other existing methods of daylight tank developing apparatus in that it requires neither changing box, nor apron. The tank is built in the form of a tube into which the developer is poured through an opening at the top. The roll of film is attached to a holder at the top of the tank, the end of the spool is connected with the plunger, and when the same is pressed down the film is unrolled within the tank, so that the developer has complete access to the whole surface of the emulsion.

Among the most interesting as well as the most valuable of the new processes, is the new Dye Impression process introduced early in 1920. The new process of negative making allows of much shorter exposures than the ordinary and the production of prints of almost any color in full daylight. None of the processes following the development of the negative require a darkroom. Briefly the outline of the process is as follows. The developed plate after fixation is immersed



PORTRAIT.

LOUIS FLECKENSTEIN.

in a "preparing bath" for the purpose of rendering the silver image impermeable to certain dyes. When this has been completed the negative is placed in a "dye bath" in which the shadows of the negative absorb the dye in proportion to their strength, while the high-lights having been rendered impermeable to the action of the dye by the first bath refuse to take up the dye and we therefore possess a dyed plate which only needs to be squeegeed to a prepared paper in order to secure a print in any color, depending on the dye used to color the negative. After all the prints desired have been made the dye is removed from the negative, and the same may be stored away until more prints are desired when the process is repeated. The materials necessary for the process, which is very economical, are furnished by the patentees—Dye Impression Photos, Ltd., London, England.

The only new developer introduced during the year which has attracted much attention is D50. The developing properties of D50 which is a mixture of some new chemical compounds of the phenolic type, was first called to the attention of photographers by Mr. John H. Gear, Hon. F.R.P.S., in the British Journal of Photography for May 27, 1921. The keeping properties of D50 according to Mr. Gear represent a decided advance over any other known developing agent. Mr. Gear states that he has successfully used a solution of D50 that has stood in an open tray for one week. He also claims for it greater energy than most developers in ordinary use, and freedom from a tendency to cause fog. Tests conducted by Mr. Gear with Dr. Adolphe Abrahams, F.R.P.S., the famous authority on high speed photography, seem to prove the especial value of the new agent for short exposures.

Mr. Gear recommends the following formula:

Solution A.

D50 Concentrated solution.....	240 minims
Water to make.....	10 Oz.

Solution B.

Sodium Sulphite Dry.....	200 Grains
Sodium Carbonate Dry.....	125 "
Potassium Bromide	5 "
Water to make.....	10 Oz.

An important advance in the research work of the year



A DREAM OF THE RAPLOCH.

JOHN M. WHITEHEAD.

which cannot help but have a large influence on future working methods is the discoveries of methods of reducing the sensitiveness of plates so as to allow them to be developed in a brighter light. The remarkable desensitizing properties of phenolsafranine was first noted by Dr. Luppó-Cramer. On Jan. 3, 1921, Mr. Raymond E. Crowther published in *The British Journal* an account of his trials with the same, and very shortly afterward the Ilford Plate Co. put a compound called Desensitol on the market. Considerable attention has been paid not only to the scientific aspects of the matter, but also to its practical application. The first is by no means settled. Dr. Luppó-Cramer considers desensitization as an oxidation phenomenon. M. Lumière also found that the most effective desensitizers were mild oxidants. However the restoration of the original sensitiveness upon washing out the dye indicates that no permanent change results. Lately M. Lumière and Seyewetz (B. J. June 10th and 24th) have published a paper recording extensive experiments on the subject. There appears to be no way of determining what dyes will act as desensitizers without actual test. Phenolsafranine is the best desensitizer according to M. Lumière, as its action extends evenly through the entire spectrum, while those of many other of the dyes examined are selective in action. An editorial in the B. J. suggests that it is within the range of possibility that an orthochromatic plate which does not require a screen may be produced by this method. Whatever may be the future developments of the process it is certain that it has come to stay, and that it is an advance of considerable importance to the practical photographer. As most of the American magazines have published accounts of the practical working of the method I will refer the reader to any of the following articles: *American Photography*, June 1921, page 328, *Camera Craft*, April, 1921, page 111, *Photo Era*, May, 1921, page 243, which is a reprint of the article of January 3 in the B. J.

The production of panchromatic sensitiveness with mineral salts by Capstaff of the Eastman Research Laboratory has opened up a new field for exploration which may develop into an extremely profitable one. Film bathed in a two per cent solution of sodium bisulphite, and followed by washing from five minutes to thirty hours, showed increasing sensitiveness



HOWARD GILES—ARTIST.

G. W. HARTING.

to the red. Without the bisulphite bath washing in water confers little or no sensitiveness. The addition of an alkali increases the sensitiveness, while soluble bromides diminish the action. The effect is due apparently to the sulphurous content of the bisulphite. No satisfactory theory has yet been found. Messrs. Capstaff and Bullock attribute it to a partial reduction of the silver salt to colloidal silver.

Mr. F. F. Renwick has also found that potassium iodide and sodium and potassium cyanide have the same effect. In the Photo Journal January, 1921, he states that a very dilute (1-50,000) solutions of the former are sufficient to render the plate markedly red sensitive. Renwick considers that the action is due to a change within the silver-bromide-iodide grain rather than anything akin to ordinary sensitizing by dyestuffs.

Increasing the speeds of panchromatic plates by treatment with ammonia is the subject of some valuable experiments by Samuel M. Burka. It was found that bathing commercial panchromatic plates in a solution of 25cc. ethyl-alcohol, 75cc. water and 3ccs. ammonia water (20% NH_3) for 4 minutes at 18 degrees centigrade and drying rapidly, increased the sensitiveness to white light 100% in nearly all cases, while the sensitiveness to red was extended 100 or more Angstrom units. In some few cases the speed in the red was increased 400%. If plates are bathed without the alcohol the speed is still greater, but the keeping quality is impaired. With the addition of alcohol plates treated with ammonia are usable after a week, but the fog rapidly increased. The method is expected to be of considerable advantage for aerial photography where high speed together with red sensitiveness is required. (Published in Journal of Franklin Institute and B. J. of Photo., August 6, 13 and 20, 1920.)

In the Hurter and Driffield Memorial lecture delivered before the Society of Chemical Industry Mr. Frank Forster Renwick, F.R.P.S., advanced a new theory of the latent Image. He considers that in our highly sensitive plates we are dealing with crystalline silver bromide in which something else than gelatine, some highly unstable form of colloidal silver exists in solid solution, and that it is this dissolved silver which first undergoes change on exposure to light. The function of ripening he explains so as to produce this colloidal silver in



A. F. Rogers, August 11, 1911

its most sensitive state. (Reprinted B. J., July 23 and 30, 1920.)

The three most important scientific works of the year in the English language are the H. and D. Memorial volume, The Silver Bromide Grain of Photographic Emulsions, and The Fundamentals of Photography.

The first is published by the Royal Photographic Society of Great Britain and contains a reprint of all of the famous papers of the researches of Hurter and Drifffield. The same is edited by W. B. Ferguson, K.C.B., Hon. F.R.P.S., who contributes an excellent summary of the early work of the two experimenters, and also a most complete bibliography of later work on the same subject.

The monograph on the Silver Bromide Grain is the first of a series of publications on the theory of photography to be published by the Eastman Research Laboratory. It is a highly scientific and comprehensive study of the silver grain. While of great value to the scientist, and of undoubted value to research workers, it is of little value to the ordinary worker.

The Fundamentals of Photography is a little textbook in simple language from the pen of Dr. C. E. K. Mees, and is quite an agreeable change from the mathematical complexity of much of his former work. The little book explains in a simple way with the aid of many charts and figures the principal operations of photography. Our only wish is that Dr. Mees might go on for several more pages in the same way for the advantage of those above the amateur stage.

The closing months of the year of 1920 were marked by the death of one of the greatest of scientific workers in photographic research. Although he had not been much to the fore during the past few years on account of rheumatism, the importance of his work grows from day to day, and there is no other man who has contributed so much to the advancement of photography in all of its branches as Sir William de Wiveslie Abney, K.C.B., Hon. F.R.P.S., F.R.A.S., F.R.S., etc. His principal works are:

Instruction in Photography	Action of Light in Photography
Treatise on Photography	Color Measurement and Mixture
Photography with Emulsions	Trichromatic Theory of Color



RESTING.

P. F. SQUIER.

and large numbers of papers to societies and the periodical press. It is to be hoped that these will be collected into one or two volumes by the Royal Photographic Society as a memorial volume. In discussing the work of Abney in the Royal Photographic Society's Journal, Mr. W. B. Ferguson says: "The great work done by Abney for the science and art of photography during the last sixty years can only be estimated by those who have the ability to understand and the industry to read through numerous papers and communications to the photographic and scientific periodical press. Of great scientific insight and breadth of views imbued with the true spirit of research and of indefatigable industry, he was not only an able experimenter, but moreover possessed the power of communicating to others in a clear and intelligible manner the bearings of the results of his experiments. The advancement of Photography owes much to him, and a study of his scientific papers extending over a period of sixty years will show in how many points the present position of photo science is due to the work of Sir William Abney."



THE REFECTORY.
WHITEFRIARS MONASTERY, COVENTRY.

A. L. HITCHIN.



A LETTER TO SANTA CLAUS.

HELEN W. COOKE.

SOFT-FOCUS VS. ANASTIGMAT LENSES

By A. H. BEARDSLEY

ET me say at the outset that I have no intention to begin a controversy, nor shall I attempt to act as arbiter. My purpose will be to take the attitude of the inn keeper in "Silas Marner" who, prevented many a broil by remarking firmly to those who were disposed to violence, "Gentlemen, you're *both* right, and you're *both* wrong, and the *truth* lies a'tween you!" By placing a few facts—as I know them—before the reader, I may render some service to the end that soft-focus and anastigmat lenses may be better understood and valued.

In my opinion there is a definite place in photography for the soft-focus and the anastigmat lens. One cannot supplant the other. Each serves its particular field exclusively. There may be cases where there is an overlapping and consequent confusion with regard to the exact dividing line; nevertheless, each type of lens is indispensable to the photographer who would express his best in photographic science and art.

The popularity of the soft-focus lens, once confined to the professional or advanced amateur-photographer, is now arousing the interest of the average camerist to such an extent that a word on the subject may be of value. Without a doubt, the soft-focus lens has come to stay. By its intelligent use, the worker can obtain effects that cannot be had in any other way without manipulation of a character too technical for the average camerist to attempt. The earlier types of soft-focus lenses were so constructed that even the professional photographer was compelled to make a special study of its use; but today such strides have been made by several manufacturers, that a soft-focus lens requires no more study than a high-grade anastigmat in order to obtain results. Of course, whether these results meet the individual requirements of the camerist is a question that he alone can determine.

Paradoxical as it may seem, a soft-focus lens requires



SOLEMN WATCHES OF THE NIGHT.

W. H. Porterfield.

he to apply the rules and suggestions of his instruction-book? From the moment that he makes the first exposure, he is working along lines that are not covered by the one book that is of greatest service to him in his tyro-days. Mind, I am not saying that it cannot be done; but it seems to me that the average beginner has troubles enough without inviting them. Let us assume once more that he does make excellent pictures and becomes master of his equipment. What is he to do when he wishes to use an outfit equipped with a good anastigmat lens?

My reason for mentioning soft-focus lenses is with the desire to be of some service to those of my readers who may be contemplating an entrance into photography via the soft-focus-lens route. By all means, enter photography; but remember that it is the successful beginner that gets the most *out* of photography. Although I endorse and would promote the use of the soft-focus lens, I would not care to do so in cases where it might result in the beginner becoming discouraged and giving up photography altogether—to the direct loss of all concerned.

It will be well for the beginner to study the soft-focus lens and to use one *after* he has been graduated up to it by thorough work and the mastery of “sharp” lenses. He will enjoy the soft-focus lens, and he may do better with it than he thinks; but first let him be a master of photographic rudiments. It will pay him a thousandfold in the end.

The anastigmat lens won its way by sheer merit until today no camera is conceded to be of very great efficiency without one. However, it has been brought to such a state of perfection that, in some cases, it has overreached itself and produces a “wiry”, cold sharpness that repels rather than attracts the beholder. It is this very perfection of sharpness and covering-power that is responsible for the soft-focus lens. However, as often happens among reformers, those who fathered the first soft-focus lenses went to extremes and were responsible for pictures that were as unnatural as they were absurd. This situation gave rise to as many attempts to obtain soft definition with an anastigmat as there are recipes to make home-brew. To-day, the makers and most users of soft-focus lenses are “back to normal”. That is, they are

responsible for pictures that have the required diffusion, but still contain the basic strength of the anastigmat lens.

This transition-period is responsible for two schools of pictorial photography—one that accepts nothing artistic that is not diffused, and the other that demands critical definition. Between these extremes there are many minor schools that adopt such parts of the two main schools as suit individual requirements.

I believe that it is safe to say that today a “sharp” picture may be considered to be artistic as readily as one that is diffused. In short, the two schools appear to have come to the conclusion that each is an asset to photography, and that neither can hope to oust the other from the field.

It seems to me that the entire question of soft-focus vs. anastigmat lenses should be brought down to the basic truth that both are needed in photography, and that the decision with regard to which is superior be left to the requirements of the work in hand, and not to an arbitrary opinion or school. In short, here we have two excellent tools which we should learn to use intelligently to express pictorially our best interpretation of a given subject. Usually, we should not select a soft-focus lens to photograph a railroad-engine for a catalog-illustration. However, there might be a case where a diffused picture of the same engine surrounded by a cloud of steam and smoke might lend itself beautifully to the requirements of an intelligent and trained pictorialist. It would be poor judgment, in my opinion, to decide in favor of either type of lens without first determining which would do the best work for the subject in hand. Remember that these lenses are tools to use, at will, to help us get the best possible results. Every photographer who can afford it should have both—not one or the other. The soft-focus and anastigmat lens may be made to work together harmoniously and to the betterment of photography. The day should be passed when the photographer is compelled to choose one or the other because of his mistaken allegiance to any school, or clique of amateur or professional photographers.

It is possible to make a picture with an anastigmat lens and to enlarge it with a soft-focus lens or vice versa. Why should it be considered photographically unethical to do so?



MRS. SIDNEY V. WEBB.

It is the *result* that we are after. The lens that helps us most to obtain the result is the lens to use either for the original negative or the enlargement. The trouble with many of us is that we lean too heavily upon the opinions and experiences of others. In a way, Camera Clubs are to blame for the desire to ask some one else before making a decision with regard to a lens or a printing-process. Mind you, I believe thoroughly in photographic comradeship as it is found in so many Camera Clubs today; but although I would advise any amateur or professional photographer to consider carefully the opinions and experiences of others, nevertheless, I would suggest that final decisions be made by the man most concerned, viz.: the photographer himself. Let him stand firmly on his own photographic feet. Let him use the lens or process that will enable him to express best the pictorial idea within him. If it be a soft-focus lens, well and good. If it be an anastigmat lens, well and good. When all is said and done, the responsibility for failure or success rests with the camerist himself.

There are several standard soft-focus lenses on the market even as there are a number of standard anastigmat lenses. There are various types that are designed to produce special results. This is true of anastigmat lenses. When it comes to the matter of making a selection, the choice of a soft-focus lens is just as important as in the case of an anastigmat lens. In short, a soft-focus lens—its selection and use—must be taken fully as seriously as in the case of a high-grade anastigmat. As I have said already, neither lens will do the work of the other; but both are needed to complete the photographer's equipment.

Even among the staunchest supporters of the soft-focus lens there is a difference of opinion as to how diffused a picture may be and still be considered artistic and beautiful. Followers of the anastigmat lens are often confronted with the problem of how sharp a picture may be without losing its claim to true art. In fact, the deeper we enter the subject the more involved does it become, and the more convinced do I become that there is a tremendous amount of energy being wasted in discussion that might well be put to the *use* of *both* the soft-focus and anastigmat lens. The more that we



A FROSTY MORNING.

G. P. KIMBERLY.

learn about these two types of lenses the more pleasure we shall have out of photography, and the greater variety of pictures shall we be enabled to enjoy.

In conclusion, let me say that there should be no more *versus* between the soft-focus and the anastigmat lens. Neither is in a position to supplant the other. Hence, let us face the fact that both are becoming indispensable and that both are ideally adapted to supplement the work of the other. Let us waste no more time in the attempt to decide which is best; but rather let us find new ways and means to make each type of lens help photography to become a greater science and a more beautiful art than ever before. Let us be glad that a new tool has been placed in our hands rather than thwart its purpose by ill-considered "snap" judgments. The anastigmat lens has made good. The soft-focus lens is making good. Let us remember that there were people who decried the steam-engine, electric light and telephone. Now all three work together in harmony to make this world a better place to live in. Soft-focus and anastigmat lenses are at our disposal to make photography a greater power in the commercial and artistic life of the world. Let us make the most of them, and let us be glad that they are helping us to reach higher and truer standards in the science and art of photography.



MOURNING DOVE NEST.

(See Page 266).

HUGO H. SCHRODER.



INGEBORG LA COUR.
Interpretative Dancer.

PERCY NEYMANN

THE PHOTOGRAPHING OF MAPS TO SCALE

By J. H. PRIDEAUX



AT times the amateur photographer is called from his pictorial work to a more serious and painstaking branch of photography—the reduction of maps to a known scale. In very large plants this is a simple matter because they have every facility for doing this work with the least possible trouble, but to the amateur who has only a view camera, this involves a serious amount of work, if he is to do the work accurately.

Some years ago the writer was called upon to reduce a goodly number of mine maps to a scale of from 100 feet to the inch to 1000 feet to the inch, a ten times reduction, for the purpose of illustrating the maps in a report.

It was practically impossible to collect the maps to a central point, as it was imperatively necessary that the maps remain in the offices of the various companies. If the maps had been allowed to go out the proper installation of the necessary apparatus could have been made permanent, as to the setting of camera in relation to the easel for this reduction, and the whole operation simplified.

Failure to get the original maps involved going to the Engineering Departments, rig up an easel of about 10 by 12 feet for the tacking up of the maps to be photographed. These maps were in some cases of very great dimensions necessitating the use of many plates to complete the property lines.

A view camera 11" x 14" was employed, fitted with an anastigmat lens of good make, long extension bellows, equipped with rising and falling front and swing back. The ground-glass was centered both vertically and horizontally, and on these center lines divisions of one inch were marked (Figure 1). The easel was also divided in the same manner vertically and horizontally, the divisions being ten inches



A WOODLAND BROOK.

Robert B. Montgomery.

apart. As this reduction was to be a ten times the one inch divisions on the ground-glass had to coincide with the 10 inch division on the easel.

In order to get clear cut negatives a process plate was used, and in some cases where the maps were in colors the necessary plate and color screen were employed.

Practically all the maps were made on tracing cloth which made the use of the process plate imperatively necessary. However, a blue print was sometimes photographed, in this

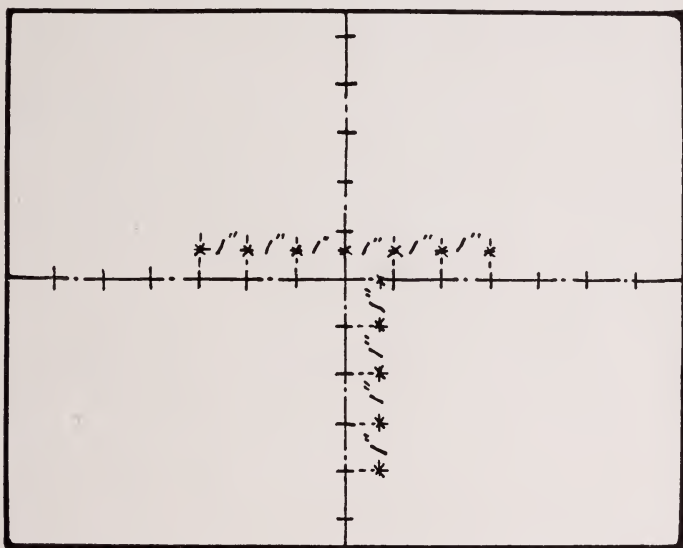


Figure 1.

Ground Glass Divisions.

case a trichromatic plate was used with an orange red screen, giving excellent results.

In all cases the lens was stopped down to a F/64 opening, giving an exposure of about two minutes as a maximum, the time of course being greatly dependent upon the light conditions. With the use of a trichromatic plate, and the orange red screen, the time was necessarily lengthened.

The camera was set on a stout tripod on a center line with the easel, and the lines centered on the ground-glass with those on the easel until all divisions were in line with each

other. In this case a 12-inch focus lens was used, and in the first set up to photograph to the required scale it was necessary to make a calculation for distance from easel to lens, from the formulæ: times reduction x lens focus, plus lens focus. For example, a scale of 100 feet to one inch to 1000 feet to the inch, thus a 1/10 reduction x 12" (lens focus) plus 12' lens focus, gave 132" from lens to drawing, and the draw of the camera was found by dividing this 132" by 1/10th, which gave 13.2/10 inches.

To facilitate the work a table was constructed to readily find the distance when other scales were used on the maps to cover a certain area, as follows:

Reduction to	Reduction	Dimensions of Map Covered	Dimensions of Plate	Lens to Drawing	Draw of Camera
200 ft.	$\frac{1}{2}$	21.0 in. x 27.0 in.	13.5 in. x 10.5 in.	36 in.	18.0 in.
300 ft.	$\frac{1}{3}$	31.5 in. x 40.5 in.	13.5 in. x 10.5 in.	48 in.	16.0 in.
400 ft.	$\frac{1}{4}$	42.0 in. x 54.0 in.	13.5 in. x 10.5 in.	60 in.	15.0 in.
500 ft.	$\frac{1}{5}$	52.5 in. x 67.5 in.	13.5 in. x 10.5 in.	72 in.	14.4 in.
600 ft.	$\frac{1}{6}$	63.0 in. x 81.0 in.	13.5 in. x 10.5 in.	84 in.	14.0 in.
700 ft.	$\frac{1}{7}$	94.5 in. x 73.5 in.	13.5 in. x 10.5 in.	96 in.	13.7 in.
800 ft.	$\frac{1}{8}$	84.0 in. x 108.0 in.	13.5 in. x 10.5 in.	108 in.	13.5 in.
900 ft.	$\frac{1}{9}$	94.5 in. x 121.5 in.	13.5 in. x 10.5 in.	120 in.	13.3 in.
1000 ft.	$\frac{1}{10}$	105.0 in. x 135.0 in.	13.5 in. x 10.5 in.	132 in.	13.2 in.
1200 ft.	$\frac{1}{12}$	126.0 in. x 162.0 in.	13.5 in. x 10.5 in.	156 in.	13.0 in.
1500 ft.	$\frac{1}{15}$	157.5 in. x 202.5 in.	13.5 in. x 10.5 in.	192 in.	12.8 in.
2000 ft.	$\frac{1}{20}$	210.0 in. x 270.0 in.	13.5 in. x 10.5 in.	252 in.	12.6 in.

By consulting this table if using a 11" x 14" plate and 12" focus lens, it can readily be seen the dimensions of a map to be covered by a given size plate, the approximate distance from lens to drawing and the draw of the camera. Of course the use of a different focus and plate will necessitate the recalculation of this table, which can readily be done by using the formulæ as given.

When a map was too large to be covered by one plate the map was marked with a line top and bottom so as to act as cutting lines for the proper joining together of the two pieces, these lines appearing on both plates.

As to development of the plates and paper used the formulæ of the maker was used as to developer, and as the reproductions were to be used for calculations a glossy paper was used of high contrast.

The above illustrates very clearly the use of the apparatus you may have at hand to photograph to a given scale should anyone be called upon to do this branch of work. Of course, where the necessary apparatus is fixed in a special room, where a specialty is made of this branch of the art, the work is



SUNSET.

DR. J. B. PARDOE.

greatly simplified, but not having the proper facilities the foregoing is of value to the amateur.

The accuracy of the reproductions of these maps were so that the necessary calculations were made from them instead of from the bulky 100 feet to the inch blue prints furnished for calculation purpose.

As the mine workings in the beds did not extend over the entire property, only being shown where worked, it was necessary to make an outline property map showing all corners. A pantograph reduction was made for check purposes, and when the photographic prints were laid on this outline the corners were found to coincide very accurately.

Another interesting piece of work was suddenly thrust upon me when I was called upon to enlarge a section of one of the United States Topographical maps, the enlargement to be $3.15/100$ times greater than the original to fit a certain scale map. In this I was handicapped by not having a large enough enlarging lantern to take in the full size section. A copy was made of smaller dimensions than the original, this was then placed in the enlarging lantern and enlarged to $4.82/100$ times, bringing it to the size of map required. The map was made in four sections, the negative having been divided so that one section could be enlarged at a time until all four sections were printed, the sections were then put together making the complete map, a test for accuracy was made and all points were found to coincide to a nicety.



GENTLE BREAKERS.

DR. W. E. ZIEGENFUSS.



RUSSIAN IMMIGRANT.

FLOYD VAIL, F.R.P.S.



Illustrating article "Stereoscopic Photography," by Charles F. Rice.

STEREOSCOPIC PHOTOGRAPHY

By CHARLES F. RICE



HOTOGRAPHY as it is usually done, with a single-lens camera, is one-eyed photography. Stereoscopic photography is two-eyed photography. And there is a vast difference.

Did you ever watch a one-eyed man light a pipe or cigar? He can't tell except by "trial and error" whether he is holding the match in the right place or not. His single vision allows but for two dimensions—width and height—but no depth or distance. So with photography, the ordinary single-lens sort reduces everything to a single plane—the surface of the print—and the picture enables us to judge the distance of objects therein only in the most general way, by their relative size, by convergence and divergence of parallel lines, by lights and shadows, and by what is called aerial perspective.

Now stereoscopic methods supply photographs with the third dimension, depth or distance. The two-lens camera sees things as our two eyes do, and the finished stereograph viewed through a stereoscope shows the scene as our eyes would see it—every object at its proper distance and standing out with a roundness that is so realistic as to be positively startling when seen for the first time. The appearance is not that of a picture on a plane surface, but is as if we were actually looking at the scene itself, except for color. The



CATHEDRAL ARCHES.

RICHARD M. COIT.

Autochrome supplies color, so that the stereoscopic Autochrome is the nearest counterfeit to nature that we can get by photography and is as much more perfect than the single black and white print as—well, there is no comparison at all.

Most people, and this includes many photographers, do not understand the stereoscopic principle. It depends on the fact that the left eye does not see exactly the same view that the right eye does, because the eyes are about two and a half inches apart and to that extent each has a different viewpoint from the other. This makes a considerable difference with objects that are close at hand, and less and less difference as the distance increases. Sight along the edge of a foot-rule as you would along a gun-barrel—right eye open, left eye closed. Now, without changing the position of the rule, close the right eye and open the left. See the difference? On the other hand, if you're looking at a church steeple a mile away, it looks just the same to one eye as it does to the other.

Say you're walking along the sidewalk and approach the corner of a building. If the building is on the right, you can see farther round the corner with the left eye than with the right. If the building is on the left—vice versa. It is this "seeing round the corners" that makes the objects in stereoscopic photographs stand out with such great roundness and relief.

I'm sure you have all made outdoor portraits where the finished print showed a tree growing right out of the victim's head! This would be quite impossible in the stereoscopic photograph. The tree might be in line with the subject's head in one photograph, but not in the other; and in the combined view as seen through the stereoscope the tree would stand back where it belongs, without in the least interfering with any nearby object.

My brother photographers of the one-eyed camera must realize that if what I have said so far is true, stereoscopic photography is not so bound down by limitations in choice of subject as is one-eyed photography. That is actually the case. Almost every scene or subject that looks good to your two eyes will make an attractive stereoscopic photograph. And you all know how far from being so that is in the case of the single-lens camera.



CHP
1920

ROADSIDE HOME.

Chas. H. Partington.

I have in mind to illustrate this point a woodland view I ran across the other day. Grass in the foreground, beyond that and down a steep bank a brook, the farther shore some forty feet distant, overhanging branches, brook disappearing in trees and bushes in the distance, sun peeping through in spots. Looked very, very pretty to the eye—no, I should say *two* eyes. To one eye, or in a single photograph, the view was a meaningless jumble of grass, trees, reflections, etc. But in the stereo, what a difference! Everything appeared at its proper distance. You could see that the water just beyond the grass was really six or eight feet lower. You could see right through the overhanging branches. The brook wound back until lost to sight among the receding trees. And you've no idea how wet the water looked!

Stereoscopic photography used to be popular in this country, immensely so. Every family had a stereoscope and collection of views on the parlor table. A veteran professional photographer was telling me only the other day what a big and profitable branch of his practice stereo work used to be. Why it went out of vogue, I don't know; but it did, and it is only comparatively recently that some attempt has been made to revive stereoscopic photography in this country. I say in this country, for apparently in Europe the practice has kept right on and has been improved and perfected, so that now there are many models of English, French and German stereo apparatus, some of them very efficient indeed. Compared with these there are only three or four stereoscopic cameras now made by American manufacturers. These are efficient cameras, too, without a doubt; but are of different size and style from the European models and therefore not altogether comparable with them.

The old parlor table stereoscope accommodated a double photograph that just about covered a mount $3\frac{1}{2} \times 7$ inches. That is, the individual print was $3\frac{1}{2}$ inches square, and this is still the standard stereo size in this country. In continental Europe, however, smaller sizes are customary— 45×107 millimetres, or approximately $1\frac{3}{4} \times 4\frac{1}{4}$ inches; and 6×13 centimetres, or approximately $2\frac{1}{2} \times 5\frac{1}{4}$ inches. Both of these sizes are standard, over there, with the 45×107 millimetres in the lead.

Two and a half inches, or a little more, it varies somewhat, is the measurement between the pupils of a normal person's two eyes. It follows that for easy viewing of photographs in the stereoscope there should be just about $2\frac{1}{2}$ inches separation between the corresponding edges of the twin prints—that is between the left edge of the left print and the left edge of the right print, and between the right edge of the right print and the right edge of the left print; or between the two images of the same point in the view as presented in the two prints. This separation is of course impossible with prints which individually exceed $2\frac{1}{2}$ inches in width. The European apparatus conforms to the rule, the American does not.

A very great advantage of the smaller sizes of stereo cameras is that they employ short focus lenses. The advantage is in the great depth of focus (or field) possessed by the short focus lens. The fabled "universal focus" is desirable in stereo photography—that is, one would like everything in front of the lens, both near and far, to be in needle-sharp focus at the same time—and the shorter focus your lens is the nearer you come to accomplishing this impossible requirement.

Lenses of the viewing apparatus (stereoscope) should be of approximately the same focal length as the lenses in the camera. Thus, the old-fashioned American stereoscope made for the $3\frac{1}{2} \times 7$ size, is not most suitable for the little 45×107 millimetres views which are taken with lenses of about $2\frac{1}{2}$ inches focal length.

Paper prints are the commonest form of stereoscopic photographs. Glossy paper is preferable because it shows fine detail the best. Transparencies on glass (similar to lantern-slides) are more effective than paper prints—they will show even finer detail, and because the light shines through them instead of merely on the surface, there is a sparkle and brilliancy impossible to attain in a paper print. Autochromes, which are glass transparencies in natural colors, are the most effective of all stereographs, and a well-done stereoscopic Autochrome viewed through the proper sort of stereoscope is almost as good as looking at the scene itself; even better, perhaps, in a sense, because you can study every detail at



OLD LETTERS.

G. P. KIMBERLY.

leisure of what in the actual scene was but a fleeting impression.

Certain rules have to be observed in stereoscopic photography. The camera has to be level, from left to right. It may be pointed up or down a little, at the risk of distorting vertical lines, without harming the stereoscopic effect. But the top of the camera must not incline to left or right. If it does, the resulting stereograph will be an "eye-twister." It will hurt your eyes trying to look at it through the stereoscope. Paper prints may be trimmed to make the crooked straight, but correction is possible only to a very limited degree in the case of transparencies on glass.

As you look at a stereoscopic negative so that the picture is right side up—and right is right, and left is left—the individual negative at the left is that which was exposed through the right-hand lens of the camera, and vice versa. Therefore, if a print is made from the entire negative, with a single exposure, the print will have to be cut in two and its halves transposed, left for right. Or the same course may be followed as in making glass transparencies—the left-hand negative is printed on the right-hand end of the transparency plate, then the negative and positive plates are shifted for the second exposure which prints the right-hand negative on the left end of the transparency. A special form of printing frame may be bought which facilitates printing in this manner. The stereoscopic Autochrome has to be cut apart and its halves transposed and bound up with a cover-glass.

No other special precaution nor procedure is necessary in stereoscopic photography. There is no obstacle (except perhaps cost of apparatus) which need deter any earnest amateur from attempting this most fascinating branch of photography. Because the stereo camera is practically two cameras in one, with twin lenses and shutters, it is about twice as expensive as a single camera of similar optical equipment. That, of course, is natural and unavoidable. I don't know of any really first class stereo camera that sells for less than \$50, and they range from that to \$200 or more. But the results are worth it.



THE WILD FLOWER.

LEONID FINK

BROMOIL RESULTS

By CHAS. H. PARTINGTON



THE increase of interest in pictorial photography in the United States was well manifested in the past year at various exhibitions, and shows great promise for this branch of art in the future. Pictorial work with the camera offers a wide range of subjects whose beauty of light, shade and general effect is increased to a great extent by the proper print medium. Wonderful results are obtained in many cases by straight printing or enlarging, but there are times when some control is not only desirable but imperative. Many things can be done to the negative to bring the desired results by resorting to controlled development, intensification, reduction, retouching, pencil work on tissue paper, etc. All have their advantages, but in most instances are uncertain or troublesome, and this fact leads us to search for a different method.

Having run the gauntlet of photography for more than twenty years and consequently passing through many stages of its development, the writer, after considering the matter for some time, decided to give "Bromoil" a trial. Text books and magazine articles on the subject were read and re-read and included writings by experienced and well-known workers. The variations in procedure of different authorities, especially where one condemned what the other recommended, was surprising, and the only thing to do was get busy to decide the how and why for one's self. The results of numerous experiments are given in the following paragraphs, and while details may seem many, as well as the process somewhat complicated, the reader is earnestly requested to give this printing medium a trial. After a few prints are made the simplicity of the work will assert itself, and the beauty of the finished picture will be well worth the effort.

The Negative.

Stress has been laid upon the kind of negative required, but the writer finds that any that will make a respectable



NEAR THE SUMMIT OF MT. BLANC.

LOUIS J. STEELE.

print by contact or enlargement will be satisfactory for Bromoil. In cases where the negative is extremely thin with no deep shadows or heavy high-lights and which produces a print gray in tone, it will be difficult to produce a Bromoil. Extreme care and patience will produce a successful result, but a beginner is not urged to try such a print until experienced to some extent.

The Paper.

The general opinion regarding this material is that all grades or makes with the exception of Platino-Matt can be made to give good results, but even this surface will be found suitable by proper handling. Heavy, double weight stock is recommended, due to the fact that it will retain the most moisture. Thin papers are very liable to dry out before inking is completed, resulting in uneven, patchy work. Of all the grades or makes tried, my own choice is P. M. C. No. 8. This is a heavy weight buff stock with a surface and thickness of gelatine very much suited for inking.

Papers such as Royal Bromide produce a very pleasing result, as the surface is entirely different from the P. M. C. The coating, however, does not seem to stand the brush treatment as well and unless care is used the gelatine is easily broken.

Portrait Bromide is a tough surface paper and is inclined to ink with a flat, dead result. The print, if made to prevent this effect and inked with a hard medium, will resemble gum work.

The Enlargement.

The enlargement is made the same as though no Bromoil was to be considered. The depth of tone and gradations should be the same as for regular work. If no attempt at control is made when inking the print, all the original quality can be held. With straight inking all gradations will appear, provided no part of the previous procedure was neglected.

Development.

After exposure the print should be developed in either Metol-Hydrochinon or Amidol made up to the formula provided by the manufacturers. Amidol is preferred, as it contains no carbonate of soda which, in some cases may



WORK, WORK, WORK, BUT HAPPY.

IRVING BERKEY.

weaken the gelatine and prove troublesome in warm weather. Amidol produces a blue-black image and seems to develop to a better depth which consequently gives an excellent relief for inking.

Development should not be forced nor checked, but the exposure should be such as to produce a full scale of gradations and stop. Checking development due to over-exposure may be suitable for an ordinary enlargement, but for Bromoil the silver must be completely reduced without fogging the highlights.

Fixing After Development.

For this part of the work there are different ideas and it is evident that some are without foundation. One article stated that it makes no difference whether a plain or acid bath is used, another simply mentions a fixing bath with no reference regarding its composition, while a third statement was decisive that an acid bath could not be tolerated.

Not wishing to get poor results the writer used a plain bath and on account of not rinsing thoroughly after development, the hypo-solution soon discolored and the prints were stained. Since then the fixing bath contains an acid hardener, besides the fact that the prints are put through an acid bath to check the action of the developer completely. The strength of the hypo is one to four and the acid hardener one to sixteen. The complete bath is exactly the same as recommended by manufacturers of developing papers. The acid checking bath is $1\frac{1}{2}$ oz. to 32.

The Bleacher.

Many bleaching bath formulæ are in existence, and it is doubtful in the writer's mind if they produce any different results. It is advisable to use a bath of good strength, as final results depend upon complete action. A satisfactory formula is given which produces first class results. Prints will bleach in 45 to 60 seconds, and should be allowed to remain for at least five minutes to make the action certain. This solution can be used repeatedly until exhausted, which is noticeable as its action gets slower. Sediment will form and this should be filtered out as it very often leaves marks on the print. These marks are easily removed by absorbent



FAMILY GROUP.

LOUIS FLECKENSTEIN.

cotton under water, but it is best not to touch the gelatine surface in any manner.

The Acid Bath.

The use of the acid bath has been discarded by the introduction of a special bleacher originated in England. As it is not always convenient to get the imported article, besides it being much more expensive than the making of your own solution, it is better to use the acid.

This bath removes all color of the bleacher stain and tends to make the gelatine absorbent, which is quite an advantage in inking. Sulphuric Acid (C. P.) is used, and while it is very strong it can be handled with sufficient care to prevent trouble. If gotten on the clothes it leaves a red mark that is impossible to remove and in contact with the skin burns quickly. In mixing with water always add the acid slowly with constant stirring. *Never add water to acid* as an explosion will result, due to instant generation of steam, and acid will be scattered broadcast.

Final Fixing Bath.

This bath is also mentioned in other cases as being plain, acid, etc. An acid hardener bath at this stage has a tendency to toughen the gelatine and is not recommended. The addition of sulphite of soda only produces the best results. This fixing bath is weak and need be no stronger than one to ten.

Washing.

Washing after first development and fixing should be thorough, and the same applies after bleaching and fixing. Prints handled over in twelve changes of water is a more certain process than running water.

Drying.

For Bromoil work it is very important that prints dry evenly, or white blotches will appear when ink is applied. To lay the paper flat at any stage of drying is sure to leave shallow pools of water which will take longer to evaporate than the balance of the surface, and in most cases a circle of white will be the result. Patches that refuse the ink are also caused by not keeping the paper moving and completely submerged at all times no matter whether in plain water or chemical



Figure 1.

Illustrating article "Bromoil Results," by Chas. H. Partington.

solutions. Papers that float, such as Royal Bromide, must be watched at all times to prevent this trouble.

At any stage of drying the paper should be drained, placed face up on clean blotters and surface dried by dabbing with a clean cloth. For this purpose a handkerchief that has been washed several times serves very well. Dab off the surplus water lightly as too rough a treatment may damage the surface.

Condensed Operations and Formulæ.

The enlargement is exposed the same as if Bromoil was not considered and developed in the following:

Water	12 oz
Sodium Sulphite (anhydrous).....	180 grains
Amidol	35 grains
Potassium Bromide (saturated).....	5 drops

After development pass print through an acid short stop as follows:

Water	32 oz
Acetic Acid (28%)	1½ oz

Rinse in clean water and fix for ten minutes in

Water	16 oz
Hyposulphite of Soda	4 oz
Acid Hardener	1 oz

For convenience the acid hardening solution is given herewith:

Water	5 oz
Sodium sulphite (anhydrous)	1 oz
Acetic acid (28%)	3 oz
Common alum	2 oz

After the prints are washed they can be dried and bleached later, or put at once into the following solution which acts quickly:

Water	30 oz
Copper sulphate (blue vitriol).....	600 grains
Potassium bromide	300 grains
Potassium bichromate	30 grains

Bleaching action should be continued at least five times as long as it takes to eliminate the deepest shadows. The bath costs very little and can be used until the action gets too slow.



Figure 2.

Illustrating article "Bromoil Results," by Chas. H. Partington.

After bleaching is completed rinse in running water, and place for five minutes in the following acid bath:

Water 20 oz

Sulphuric Acid (C. P.)..... 1 oz

After another brief rinsing fix for ten minutes in

Water 20 oz

Sodium sulphite (anhydrous) 1 oz

Hyposulphite of soda 2 oz

After a thorough washing, the prints can be dried for future inking or inked at once. The question of drying after first fixing as well as the fixing after the bleacher is used, is given great concern in some articles. One statement applies that seventy-five per cent of Bromoil failures are due to not drying the print between operations. This has been proven to have no foundation, as the writer has produced the same results in inking, whether dried at different stages or not. The advantage of not drying is that no prolonged soaking in water is necessary to raise the relief.

After the bleaching, fixing and washing is completed the print can be inked at once, provided the relief is sufficient and this can easily be determined by draining and examining. The proper effect is easily noticeable as the highlights are raised and the shadows sunk. If the relief is not sufficient, a ten minute soaking in water of 115° F. will produce the desired result. Warmer water is not necessary, and an excessive temperature may make the gelatine too weak for brush action. The temperature given is almost necessary if print has been dried after bleaching unless the worker has several hours to waste soaking the print in water from 70° to 80°. Some articles denounce high temperatures, but the writer finds them an advantage.

The Inking Pad.

A stout sheet of glass somewhat larger than the print should be provided as well as four to six sheets of clean, lintless blotter. The latter should be soaked in water and laid one on the other upon the glass and the surplus water removed by light action of a squeegee roller.

The Ink.

The ink used is such as made for lithograph work and is in most cases imported from England. It is manufactured



"FAST FALLS THE EVEN-TIDE." Lawrence C. Randall.

expressly for Bromoil work, and can be procured in both hard and soft grades, and in various colors. The unsettled conditions, due to the war have made it difficult to obtain ink, and the writer decided to take up the matter with manufacturers in the United States.

Details of the process and samples of foreign inks were submitted to The Ault & Wiborg Co., of Cincinnati and they proceeded to make an ink which worked very well. The efforts of this firm demand appreciation, and their very obliging manner and willingness to help proved an advantage. Special colors are made to order even in small tins of two ounces, and the cost is far below the foreign product. Stiff or soft inks are made as requested, and a color or density once established can be duplicated any time. Any one taking up this work, or having had experience, will do well to get in touch with this manufacturer for any particular ink desired.

Inking the Print.

The print is drained and laid upon the wet pad and surface dried by dabbing lightly with a clean soft cloth or handkerchief. When this is done the relief should stand out boldly and if not very much in evidence, the print should be soaked again.

The ink should be applied to a clean plate of glass of ample size (about 8 x 10"). A lump as large as a pea is sufficient for several 10 x 12" prints and should be spread in a thin layer by means of a palette knife. The amount of ink mentioned should be spread over an area of about 2 x 7" and the balance of the glass used for dabbing off the excess on the brush.

The brushes used should be of the stag-foot shape so as to permit presenting a full surface to the print when held at an angle. Straight face brushes will do as well, but as they must be held vertical they tend to hinder inspection of the work as it progresses. The manipulation of this form of brush is also tiresome, and therefore it is better to use the slant type made especially for the purpose.

These tools are specified by numbers and a No. 10 is about 7/8" in diameter. The greater the number, the larger the diameter and for prints about 10 x 12" the worker should pro-

vide one of each No. 5, No. 7, No. 10 and No. 14. The necessity of having about ten or twelve brushes, whether of the same size or not, is generally recommended in order that dry ones may always be on hand for "hopping" or removing surplus ink. Two or three extra brushes in addition to the inking one are sufficient, as they can be cleared of ink by rubbing on clean paper when necessary.

To properly ink the print it is imperative that the brush be very lightly charged on the tips of the hairs only. Excess ink may be removed by dabbing on a clean section of the glass leaving just enough on the brush to show on the skin when drawn across the hand. Remember that you are inking a paper print and not painting a house. It is far better to apply too little ink than too much, and there is no excuse for applying color merely for the fun of removing it again.

To apply the ink after brush is charged, hold it at the extreme tip with the thumb, first and second fingers. This gives a springy and soft action and with strokes about five or six per second the ink should take readily. Dab straight toward the print surface and don't drag, as in painting or the color will not be forced into the gelatine. This dragging action may also break the coating and ruin the print. It is preferable to start inking in the upper left-hand corner and work diagonally until ending in the lower right, but no definite rule need be followed. Any procedure that will ink the print evenly is satisfactory. The brush should be freshly charged repeatedly by dabbing on the glass, as the main thing is to apply the ink lightly but in the same density.

Much has been put in print regarding the application of ink to the print, and a great deal could be added in this article, but owing to the fact that the writer found this operation of Bromoil to vary with instructions, it may be best for the readers of the *Annual* to determine their own method. A few notes on results obtained and reference to Figure 1 (Page 53) will give a few ideas of what brushwork will accomplish.

The section denoted by "A" has been pigmented with a heavily charged brush and no attempt made to change the result. This blocks the shadows and increases the glare of the highlights, thereby giving a soot and whitewash effect of extreme contrast. A better result would have been



EVEN-TIDE.

EUGENE P. HENRY.

obtained by using less ink and a quicker action of the brush.

At "C" the result of a brush not having enough ink is illustrated. This gives not only a soft effect, but very flat as well. There is no snap or life as at "B".

Applying ink as heavily as at "A" was done at "D" also and "hopping" resorted to. This is done with a dry brush held about one inch above the print, then dropped and allowed to rebound when it is caught and dropped again. This action can be very quick and soon removes the excess ink from the surface. A more convenient method is to attach a stiff steel wire to the brush about ten inches long and at right angles to the handle which affords a means of quick tapping of the brush. Hopping will produce a grain effect and contrast, but if the action is too severe the gelatine surface will be ruined. The trees at section "E" were hopped in order to lighten the tones and produce the effect of distance. The sky has not been inked at all except for the slight overlap at the roof of the cabin.

The portion at "F" shows the surface as it appears when first inked and a partly blank surface not touched at all. This part was included in the illustration merely to show the smudgy effect when ink is first applied. At "G" the print has been inked with a properly charged brush and slightly hopped to clear away the flat appearance.

Figure 2 is the completed picture inked to suit the ideas of the maker. Such things as softer ink, a heavily charged brush, no hopping, etc., would give entirely different results, and therefore the effect of the final print is all in the hands of the worker. A comparison of this illustration with the first one should give an idea of what can be accomplished. Figure 3 is an example of Bromoil for sunlight and shadow effects and this medium produces a result that is many times more effective than a straight bromide. The real beauty of a Bromoil print is the inked surface and texture. Half tone illustrations are not able to show this process to advantage and therefore those who have never seen a print of this kind have missed much. The process is not in the least expensive and is well worth a trial. A few disappointments may be encountered at the beginning, but a reasonable amount of care and patience will soon bring success.



Figure 3.
Illustrating article "Bromoil Results," by Chas. H. Partington.

KALLITYPE

By JAMES THOMSON

N years past my methods of working with my own formulae have been fully described in the photographic magazines and recorded in the British Journal of Photography Almanac, "Epitome of Progress." Inasmuch as I have done no experimenting along kallitype lines for the last few years I have really nothing new to offer.

To offset this it has been urged by Mr. Sigismund Blumann (who not long ago sent me some really beautiful kallitype examples done on thin paper) that there are new workers in the field to whom kallitype as a mode of pictorial expression is not known.

To do full justice to such a subject requires more space than I at present have at my disposal. In the "Formulary" at the back part of the present volume (Page 279) my kallitype formula for black and white effects may be found, and is as follows: Distilled water, 1 ounce; citrate of iron and ammonia (brown), 25 grains; ferric oxalate (Merck's or Mallinckrodt's), 15 grains; chloride of copper, 8 grains; oxalate of potassium, 33 grains; nitrate of silver, 15 grains; oxalic acid, 15 grains; gum arabic, 10 grains; 5% bichromate of potassium solution to suit (4 to 10 drops). There are a half dozen variations of this formula (to suit special needs), but by modifying, it may be made to answer for any quality of negative, dense or otherwise. For example: All that is necessary when too vigorous is to dilute with distilled water. On the other hand, contrast may be had by adding more bichromate solution, by using a stronger developer, or by using a few additional grains of the iron.

When from undiscoverable cause the formula refused to produce prints up to the mark I have saved the day by adding to the sensitizer some 10 drops of platinum solution. The success of this experiment started a new line of thought, the result being a new and less complicated formula, which, in



Illustrating article "Kallitype," by James Thomson.

the hands of the novice, is less likely to give trouble. As a matter of fact, I personally for years have used no other. The formula is as follows: Distilled water, 1 ounce; citrate of iron and ammonia (green scales), 20 grains; ferric oxalate, 20 grains; oxalate of potassium, 18 grains; gum arabic, 10 grains; platinum solution 10 drops; bichromate solution from 4 to 10 drops. This forms a clear solution that ordinarily requires no filtering. Put aside for twenty-four hours before using, then shake thoroughly.

When ferric oxalate is in prime order excellent blacks are obtainable, but in any event good browns are possible. Browns of purple cast are resultant of a preponderance of ammonia iron citrate over the ferric oxalate.

As regards the No. 1 formula care must be exercised in compounding. Place the ounce of water in a dark bottle and add the chemicals in the order given. Turn bottle upside down once or twice and put away for twenty-four hours to soak. Now, shake well and filter by placing a wad of absorbent cotton in a glass funnel and pouring over it the solution sediment and all. This done, take the wad, fold it and squeeze back all liquid, rejecting only the gritty particles. This sensitizing medium is of the nature of an emulsion, it being necessary to retain the brown sediment in order to get full printing capacity, the gritty particles alone being rejected.

Coating may be done with a flat camel-hair rubber-bound brush, or a flexible pad made of sheet celluloid folded once and covered with cotton flannel as described in Photo Miniature No. 47. A thin even coating repeated if necessary is essential. Rough paper may require but a single coat, but smooth may require two. Experience can alone determine that phase of the matter.

In order to get velvety depth and richness of deposit a good surface of sizing is necessary. Strathmore water color paper which I use for particular work requires thus to be sized. With ledger papers one may do without sizing, but richer prints will follow the application of arrowroot. For small dimensions writing papers can be employed, Japanese tissue and wedding card bristol are others that are useful. Some most artistic effects have been had with cream-laid Old Hampshire linen paper. Some very unusual effects have been



THE LOVE STORY.

Kate Smith.

had by using tinted writing papers, buff, pink, pale green, pale blue and the like. As a matter of fact good results have been had on the commonest of paper stock, even on cover paper, but of course for lasting effects only pure linen papers should be used.

Underprint—say there is a face in the composition—then only the more prominent features should show, detail of skin, eyes, mouth and the like not appearing at all. Take from the frame and immerse in the developer which is prepared as follows: Distilled water, 1 ounce; silver nitrate, 40 grains; citric acid (crystallized), 10 grains; oxalic acid, 10 grains. When thoroughly dissolved filter through fine linen or muslin. *To develop use a porcelain tray.*

This is a stock solution, and to each dram used take and dilute with seven drams of water. Immerse the print face down, immediately turning over to break bubbles. The image quickly flashes up, but print may remain in bath a trifle longer, development completed, rinse and immerse in weak hypo for five minutes: Water 32 ounces; hypo 50 grains. Wash for half an hour.

Impure whites will follow where fixation has been insufficient.

For a size we may employ arrow-root, 2 to 5 grains to the ounce of water. Beat up in a little cold water; add the remainder of the water hot and bring to a boil when it will lose its cloudy appearance. A porcelain-lined vessel should be used, and the size strained through cheesecloth.

Small sheets may be sized by immersion, afterwards suspending by a corner to dry.

The platinum solution may be prepared as follows: Take 15 grains chloro-platinite of potassium and dissolve in 1 ounce of water. Add 2 drams 50% phosphoric acid and water to make 2 fluid ounces. Distilled water should be used.

When a kallitype or platinum printing formula fails to give satisfactory results the fault is usually in the ferric oxalate, which is a chemical prone to spoil on the shelves of the dealer, and sold in such condition. In prime order ferric oxalate comes in glistening greenish-brown scales which rattle when the bottle is shaken. When powdery and matted together there has been a change from the *ferric* to the *ferrous* condi-

tion, which renders it worthless for our purpose. To test any doubtful solution add ferricyanide of potassium, when if any ferrous salt be present it will strike a blue precipitate, but if ferrous salt be only slightly present the ferrocyanide of potassium (red prussiate) will restore it again. My own plan is to pour out a little of the solution on a white plate, and add a few drops of red prussiate solution, when, if suitable to use, the color is green, whereas, when totally spoiled it is blue, the Turnbull's blue of the blue-print.

Buy ferric oxalate in ounce bottles and keep such bottles in an air-tight preserving jar.

Slightly over-printed pictures can be reserved for toning with uranium which has a reducing effect and furnishes colors all the way from rich brown to red chalk.

While kallitype cannot compare with platinotype in lasting qualities, it is the equal in appearance to that beautiful process the basis of each being the iron salts.

It has been unfortunately true that kallitype prints, made in accordance with the original formula of the inventor, have had poor lasting qualities due no doubt to the imperfection of the mode of fixation. Not a print made by me with the original formula but what in the course of a few years gave indication of deterioration. On the other hand, prints made by the "Thomson" formula as much as a dozen years ago, have, so far as the eye can detect, faded not at all. One hung in strong light for that length of time is seemingly as brilliant as when made.



Illustrating article "Kallitype," by James Thomson.

CAMERA CLUBS AND PICTORIAL PHOTOGRAPHERS

By LOUIS F. BUCHER



O one will dispute the fact that America is well equipped with pictorial photographers. On the other hand, it may surprise you to read that the U. S. A. is woefully lacking in the very means of producing excellent camera workers; I mean that of Camera Clubs or Photographic Societies. It is true that we have a splendid organization, composed of many of the country's best workers. It is a sort of Alumni of the photographic field, an association the greater part of whose members are finished workers. It is also true that there are about forty other organizations many of which are struggling along in an attempt to "promote and cultivate the art and science of photography". Among these forty or so organizations are several that are doing much to accomplish their purpose. The membership of these societies ranges from fifteen members to as high as five hundred. A small club membership is sometimes due to so-called exclusiveness and sometimes to the inability to interest others. But progressiveness is the dominant factor in enrolling large numbers.

From these facts one can readily see that our country is far behind in the matter of photographic societies. This is the more apparent to anyone who has become familiar with the activities of our English cousins who can proudly boast of a society in every town of any size. And you must remember that the area and population of the British Isles are small compared to those of the United States.

While I have no accurate knowledge in proof of my statement, I venture to say that only a small percentage of the pictorial workers of America are members of any local camera organization. By "pictorial workers" I mean those whose names are usually seen in the Salon catalogs. Now the question why? From my own experience, I believe that the entire fault does not lie with the pictorial worker. Some



THERE'S ONE.

LOUIS F. BUCHER.

of the clubs are to blame in that they have discouraged the advanced worker from joining their forces by being too ready to classify him as "professional", or, as is often the case, because of just plain jealousy. It is logical to assume that the majority of workers in any Camera Club consists of those who give little thought to the really serious side of photography, and the majority can be the means of making or breaking the club by its condemnation of camera work that "is way above their heads". They cannot appreciate it. But that does not mean that it is not good work, nor that it should be called or classified as professional. In fact, I am firmly of the belief that professionals, in the true sense of the word, should be encouraged to join forces with the amateur. Of course such workers would not care to, and should not be expected to compete in club competitions with the amateurs, at least not with the beginners, for that would discourage the latter. It is my opinion that Camera Clubs will find professional photographers willing and eager to lend a hand in the advancement of photography, for they realize that the future professional will be a graduate from the school of amateur experience.

Another fault to be found with the organization of Camera Clubs generally is the lack of the sense of personal responsibility. Executives are oftentimes chosen because they are "good fellows", rather than because of ability to direct the club and to plan properly for its management. That holds good also of committee chairmen. It is considered to be an *honor*, and that is why many accept, giving little thought to the duties and responsibilities of the position. If you ever have had any correspondence with them, you know what I mean. Now why should that condition exist in these enlightened days. A voice from the dark says that it is because they all work without pay and do not have to work if they do not want to. True! But if that spirit actuates them they should relinquish the job and let some one else take it, for surely there is some person in the organization who would make good. The officials of fraternal organizations, with few exceptions, are not paid. You will find officers and committeemen in such orders taking great pride in the growth of their society. Now let's bring such a condition



SAN DIEGO EXPOSITION, SAN DIEGO, CAL. CARL H. KATTELMANN.

to pass in the photographic world. When the day comes that Camera Clubs and Photographic Societies are conducted and managed on a businesslike basis, with a thought for all and malice toward none, the pictorial photographers will be *seeking* membership; eager to help in promoting and cultivating the art and science of photography. And it should be so to-day. The Camera Club should not be too big for the pictorial photographer, nor the pictorial photographer too big for the club. Harmony should reign; with the club seeking the aid of the advanced worker and the latter in turn, offering his assistance to the local club. If the community is so unfortunate as not to have an organization, the pictorial workers should see that one is immediately founded.

Let you and me dream for a moment. In our dream we see a photographic organization in every town of any size in the U. S. A. John Paul Edwards is the president of one in Sacramento; O. C. Reiter heads one in Pittsburgh; the destinies of the Buffalo organization are in the hands of W. H. Porterfield; A. F. Kales has charge of that in Glendale, Calif., while T. O. Sheckell officiates at Salt Lake City. At Cincinnati, Seattle, Chattanooga, New Orleans, Dallas, Memphis, and all other big cities now without an organization, in our vision, flourishing clubs are pictured. Our dream continues and we find that they are all members of a national organization, conducting Interchanges of high-grade prints and lantern slides. Many one-man exhibits by the best workers of America are circulating among these clubs. One of the many Salons now held has been recognized as *The Annual Salon* and has the indorsement of this national organization. Other Salons are of course held. Every owner of a camera of any kind belongs to the Camera Club in his community and is endeavoring to earn the honor of being called a P. P., meaning Pictorial Photographer, of course. Affiliation with this national association carries with it that spirit of good-fellowship and cooperation which is part of every individual member and every club. The dealers, manufacturers, importers, and magazines are lending a hand. In fact, we see a national convention held for general discussion and for the election of officers. In fact, our dream pictures this convention as being held in the city in which the



Belle Johnson.

annual salon is being shown. At this convention and the salon we see the latest in photographic equipment and the best in photography.

Some dream, and yet it can be realized if the pictorial photographers everywhere and the Camera Clubs and Societies get together. In the absence of a club, let one be founded. Aye, let us do this. Let the new year see the formation of many new clubs and a great increase among photographic workers in America. To help this good work along a brochure has been published and is being distributed by the Associated Camera Clubs of America, under the title "The Camera Club, Its Organization and Management". It will be sent free upon application to the association, at 878-880 Broad Street, Newark, New Jersey. Over two hundred and fifty applications for this booklet were received within the month after its issuance. This augurs well for the realization of our dream. Let us see what we really can do when beginners, novices, amateurs, advanced amateurs, pictorial photographers and professionals get together in their own community and nationally, form a club or join that one already in existence, and work for the advancement of the art and science of pictorial photography.



PATIENCE.

EDW. L. GILROY.

PHOTOGRAPHY AS APPLIED TO RADIOGRAPHY

By S. A. SCHWARZ

O the alchemist of the sixteenth century belongs the honor of having first perceived a definite change that took place in silver chloride (Ag Cl) known to them as Luna Carula, upon exposure to light. They interpreted this change which was a decided darkening, as a species of transmutation of metals. It was Scheele, a Swedish chemist (in 1777), who investigated the properties of silver and proved the actual changes that took place in this chemical decomposition.

Scheele found that upon exposing silver chloride to the action of light beneath water, a substance was dissolved which upon application of silver nitrate (Ag NO_3) gave once more silver chloride, in the form of a heavy black precipitate. He further proved that upon adding ammonia in some form or other, the black precipitate was changed into an insoluble residue which upon examination was found to be pure metallic silver.

Subsequent experiments by Thomas Wedgewood, Sir Humphry Davy, Dr. Wollaston, Niepce and Daguerre demonstrated the possibility of coating a highly polished surface with Nitrate of Silver and upon this surface producing an image by means of the rays of light.

The silver plate which Daguerre used as a support for the sensitive coating of his then famous Daguerrotype was soon replaced by a glass plate coated with albumen which acted as a vehicle for the silver salts. Later the albumen was replaced by a collodion emulsion which in turn was soon supplanted by a coating of gelatine. This last process is still in use at the present day.

Generally speaking the emulsion or sub-stratum is evenly spread over the plate and when it has sufficiently hardened the sensitive salts are introduced. The chemicals used in



FOOT OF CHILD. SPACES SHOWING AREAS NOT YET
OSSIFIED.

Illustrating article "Photography as Applied to Radiography," by S. A. Schwarz.

order to render the emulsion sensitive to the actinic rays of light are the following:

Ag NO_3 = Silver Nitrate.

KBr = Potassium Bromide.

KI = Potassium Iodide.

In the making of the plate the following reaction takes place



and

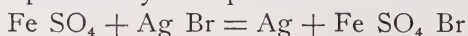


Upon exposure to light the plate undergoes certain chemical changes which are invisible and remain so until the plate is developed, that is to say the latent image is brought to the surface.

The first plate (glass) which had an emulsion on it, was the wet plate, and was first used practically by Schoenbein, a Swiss chemist. The vehicle employed for the purpose of carrying the sensitive coating was ordinary cotton dissolved in nitric and sulphuric acids better known as collodion. This plate after having been coated with collodion was immersed in a silver bath and both exposure and development were carried on while the plate was still wet.

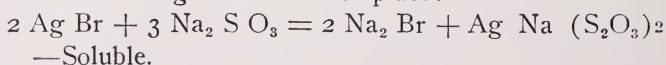
Various experiments lead Schoenbein to the conclusion that the developing agent which best reduced the haloid acted upon by light to metallic silver was a ferrous sulphate solution (Fe SO_4). After development the plate was immersed in a strong solution of potassium cyanide, which dissolved all the free silver not acted upon by the light. Owing to its highly poisonous quality potassium cyanide was soon replaced by sodium thiosulphate commonly known as hypo which produced the same chemical action as potassium cyanide.

The chemical reaction which takes place in the process of development may be expressed as follows:



this reaction depositing pure metallic silver Ag upon the surface of the plate.

In the process of fixation using hypo as the chemical medium the following reaction takes place:—



A practical test of the chemical reaction as well as the



FRACTURE OF FIBULA SHOWING DISPLACEMENT AND
OVER-RIDING OF FRAGMENTS.

Radiograph Taken Through Cast.

Illustrating article "Photography as Applied to Radiography," by S. A. Schwarz.

reduction to metallic silver may readily be performed as follows:

Take 25 cc of nitrate of silver in solution. To this add an equal amount of water. In a separate container dissolve a few grains of Metol, Pyro or any of the commonly employed developing agents. Upon mixing the two liquids a heavy black precipitate is formed which is pure metallic silver.

A simple chemical experiment which readily illustrates the reducing power of Hypo may be performed as follows:

To a solution of 50 cc of nitrate of silver add 25 cc of a saturated solution of sodium chloride (common kitchen salt). Immediately a heavy white precipitate—silver chloride—is formed. If Hypo is added 5 cc at a time while stirring the silver chloride it will be seen that the latter gradually disappears—goes into solution.

In modern days when the keeping quality of a plate is one of its greatest assets we find that the collodion or wet plate is readily pushed aside by the dry plate, which besides having greater keeping qualities has the added features of speed and latitude.

The sensitive coating of the dry plate in accordance with Abney (Treatise on Photography) is prepared as follows:—

Pot. Iodide	0.3 gr.	in 35 cc of water
Pot. Bromide	8.7 "	" " 40 " " "
Nelson No. 1 Gelatine....	2.0 "	
Silver Nitrate	11.4 "	" " 15 " " "
Heinrich Gelatine	10.0 "	
or Nelson No. 1 Gelatine.	6.0 "	

It may be said here that the ingredients as given above are almost universally used by all plate manufacturers of today varying only the ratio of the ingredients so as to insure greater or less speed.

The plates employed in Radiography are divided into two distinct groups—single and double coated.

The single coated plate as its name implies has only one gelatine coating, which carries the sensitive salts. For general work this probably is the most popularly known and the most universally employed plate. In work where greater penetration is required, and where owing to a prolonged exposure the possibility of halation is greatly increased, the double



O. C. CONKLING.

coated plate will be found more advantageous. This plate is coated with two distinct emulsions—the first one, or the one nearest to the glass, being the absorbing emulsion. It consists of a surface which is very slow, and as its name implies its function is to absorb the light before it reaches the glass, thus preventing secondary radiation and its natural consequence halation.

This emulsion when dry in turn is coated with another thinner and faster sensitized mixture, which takes care of the weaker rays which strike the surface of the plate.

In order to facilitate the handling of the plates, and above all keep all metallic substances away from it, the plates as a rule are loaded in double envelopes. One the inner is black and the second the outer orange red. Probably the simplest, and at the same time the safest, method of handling and loading these envelopes is to place them on the table in pairs red first and black on top with the flaps of the envelopes down. The plate is now inserted into the black envelope first which in turn is then inserted into the red. Care should at all times be taken that the pasted portion of the envelope does not become superimposed upon the emulsion side of the plate. This loading of envelopes is to be carried on in a room illuminated by a ruby or safe-light. As not every ruby light may be considered safe, it will be found advisable to test the one in use before exposing any plates to its rays. A simple yet effective test is to expose say half of an ordinary plate to the light coming from the lamp. This is done while the other half of the plate is held between the leaves of a book. If upon development the plate shows no darkening in the portion which was exposed to the ruby light, the lamp may be considered safe; if on the other hand a dark area appears upon development, it will be a sure indication of the fact that the ruby lamp should by no means be regarded as a safe illuminant of the dark-room, but should be made so. The introduction of a few sheets of orange or ruby fabric will as a rule remedy this evil, and render the lamp quite safe.

As already stated the most universally adopted method of exposure for plates or films—(the latter having been placed upon the market quite recently) is to have them in double envelopes of red and black light proof material. This method



THE FATE OF THE WILLOW.

STEPHEN H. WILLARD.

proved a rather serious handicap especially when exposures of exceedingly short duration were required.* Such exposures when made were as a rule hopelessly undertimed and practically rendered valueless for diagnosis. In order to overcome this decidedly serious drawback intensifying screens are employed. These screens may be composed of different chemical constituents such as zinc sulphide, calcium tungstate or platinocyanide of potash, mounted in an aluminum frame or cassette very much resembling the ordinary printing frame. The X-Ray plate after having been carefully dusted is placed in the dark-room, into this cassette, emulsion side in contact with the screen. The cassette is then closed and is ready for exposure. In order to take the radiograph the cassette containing the plate is placed in apposition to the patient in such a way that the ray will pass through the glass side of the plate to the screen, the latter becoming fluorescent intensifies the plate and permits of a much shorter exposure. As it is an exceedingly difficult matter to get the screen free of all grain, it will be found that its granular surface at times is reproduced on the plate causing the texture of the emulsion to show certain irregularities which are likely to interfere with definition.

Storing of Plates.

Owing to the intensely strong penetrating power of the X-Ray more than the usual precautions for storing of the sensitized materials are to be observed. Experience has proven that a large lead lined box is about the safest, most economic as well as convenient way. In addition to the protection against the ray care should be taken not to store the plates where they may be attacked by the fumes of such chemicals as acetic acid, ammonia, nitric or sulphuric acid, as their action upon the sensitive surface of the plate may prove quite detrimental.

Development.—Chemistry:

After the light sensitive material has been exposed to the action of the ray for a short time a chemical change takes place which remains latent until the emulsion is subjected

* Especially in stomach plates where peristaltic waves are to be considered and exposures of 1/10 of a second are required to stop motion.



NORMAL KNEE-JOINT SHOWING FOREIGN BODY IN KNEE
JOINT (TIP OF NEEDLE).

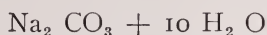
Illustrating article "Photography as Applied to Radiography," by S. A. Schwarz.

to the action of an oxidising or reducing agent more commonly known as a developer. Its action consists in removing the bromine from the sensitized surface leaving behind a deposit of black metallic silver which forms the image.

The most popular reducing agent is Metol, or any one of its substitutes taken from the Paramidophenol group, being either a sulphate or a chloride. This developer catering solely to detail does not by itself make a suitable compound, as it does not impart density to the negative. The addition of Hydrochinone will assist us greatly in overcoming this difficulty. There are very few developers which can successfully be employed without the addition of other chemicals. Developers in order to act properly must be in alkaline solution, the strength of the developer depending vastly upon the amount of alkaline present. The greater the reduction potential i. e., the more rapid the action of the developer the less alkali will be required. Hydrochinone offers a splendid example of the above instance. It is in many cases used with caustic alkalis, while other developing agents require only weaker carbonated alkali. Let us for a moment investigate more carefully the action of the alkali and what takes place if such alkali are added in the wrong ratio. The presence of too much alkali in the developer has the tendency to produce chemical fog or veil. A condition which renders the plate more or less dense in the high lights and only partially transparent in the shadows. A plate of this character is termed flat, or non-contrasty. If on the other hand too little of the alkali is present the developer will act too slowly, thus producing an unsatisfactory negative which as a rule due to prolonged development will show discoloration as well as traces of light fog.

The alkalis used in development are of two kinds: The caustic and the carbonated alkalis. The former are not used as frequently as the latter which are salts of carbonic acid (H_2CO_3) as they are not as rich in alkalis as the carbonates. Of the carbonates employed perhaps sodium carbonate is the most popular. It is marketed in two forms, either crystals or in anhydrous (dehydrated). If sodium carbonate is re-crystallized from an over saturated solution each part of

sodium carbonate will absorb in the process of re-crystallization 10 parts of water and should be expressed as follows:



It is for this reason that when sodium carbonate is employed in crystalline form to compound the developer a greater quantity of the chemical must be used. If on the other hand the soda is heated to between 85 and 98 degrees Fahrenheit so as to expel all the water, the dried crystal ground to a fine powder, we obtain the dehydrated soda, a chemical of far greater strength as well as keeping qualities.

We have found that a tray containing a developing solution after having been exposed to air will gradually turn brown and then black. This chemical change or oxidization is due to the fact that the developing agent or rather its ingredients have a great affinity for the oxygen of the air. A pure developing agent in solution, either Pyrogallic acid or Metol will within a very short time turn dark and thus be rendered entirely useless. In order to minimize this possibility another chemical substance having the same or greater affinity for oxygen is introduced. This chemical will absorb an equal amount of oxygen from the air, prolong the life of the solution and thus fulfill the duties of a preservative. To accomplish this a certain amount of sodium sulphite $\text{Na}_2 \text{SO}_3$ is added to the developer. As this chemical may also be obtained in crystalline as well as anhydrous form the same conditions are to be observed as in the case of the carbonate. It has been found advisable to introduce into all developers a small quantity of potassium bromide K Br which acts as a restraining agent, permitting the high lights to acquire density without clogging the shadows.

We have thus found the composition of a developer as follows:—

1. Metol—The developing (oxidizing) agent.
2. Sodium Sulphite—The preservative.
3. Hydrochinone—A second reducer to obtain contrast.
4. Sodium Carbonate—The alkali acts as accelerator.
5. Potassium Bromide—Restrainer.

Technique of Development :

The chief causes of failure in development are:—

1. Lack of cleanliness.

2. Unsafe light.
3. Careless manipulation.

No. 1. Taking these in order as enumerated it will be found advisable never to use a dish which has been emptied of its contents until it has been carefully washed in hot water and some abrasive soap, after which it should be rinsed in a weak solution of nitric acid.

The same trays and tanks or dishes should always be used for the same purpose, and labeled with that end in view. Keep all beakers, graduates and other accessories scrupulously clean, as the chemicals used in photography have destructive tendencies towards each other.

No. 2. A good test for the safe-light has already been given in one of the previous paragraphs (Page 80).

No. 3. A great many plates are rendered absolutely useless owing to the careless handling they receive at the hands of the operator, either before, during or after completion of development. A great deal of the discomfort and annoyance resulting from the above may be avoided if the plates or films are handled with care, being particularly careful not to touch the sensitive surface with the fingers.

Process of Development:

Development which must be carried on in the dark-room can be accomplished in two distinct ways. Either by tray or tank. Both ways are good, give splendid results, and have attained a widespread popularity. In hospitals where the departments of radiography and photographic research are two of the most important divisions the development of all plates and films coming from the X-Ray department is carried on in large tanks. Some of these tanks hold 25 gallons of solution and accommodate from 24 to 36 14 x 17 plates. In places where the quantity of the plates is large, tray development becomes practically impossible. The technique of development does not differ from ordinary development to any great extent excepting that the process is carried quite a good bit further. This is especially the case in bone lesions where a good bit of density as well as detail is wanted. After the plate is fully developed it is washed for a few minutes, and is then inserted into a bath of acid hypo. Here the unexposed silver is dissolved and the negative



IN CHILMARK.

G. W. HARTING.

rendered transparent. After fixation is completed the plates are washed for one hour in running water and then hung up to dry.

It might not be amiss to mention here a few of the most common causes of failure and perhaps suggest remedies for them.

1. Plate slow in starting—Developer too cold or plate undertimed.
2. Lack of detail in the shadows—Wrong exposure, not enough time.
3. Plate flashes up within a few minutes—Greatly overtimed.
4. Mottled plate—Developer not agitated.
5. Finger marks—Careless handling.
6. Frilling—Developer too warm, or too alkali.
7. Unevenly developed plate—Not flooded evenly at beginning.
8. Blisters—Uneven temperature of the various solutions used. Acid hypo too strongly acid.
9. Pinholes and spots—Plates not dusted before loading.
10. Round white spots—air bells—Caused by carelessly inserting plate into developer.
11. Negative yellow or otherwise discolored—Impure sodas, or old developer.
12. Dense negatives—Overtimed.

The following are the remedies suggested for the above errors:

1. Have the developer as near normal temperature as possible, that is to say 65 degrees F.
2. Increase your exposure.
3. Diminish the exposure.
4. Rock tray or employ a mechanical rocking device.
5. At no time touch the emulsion surface of the plate with hands.
6. Keep solution at the proper temperature, reduce sodium carbonate.
7. Make sure of covering the plate evenly with the developer.
8. Have solutions and wash water as nearly the same degree of heat as possible.



JUST IN FROM THE GARDEN.

Jessie Tarbox Beals.

9. Dust plates carefully before loading into envelopes and also before development.
10. Insert the plate into the developer so as to cover it completely with one sweep. Keep tray in motion.
11. Do not use a cheap grade of chemicals, and do not try to economize by using the developer too long.
12. Do not carry development too far.

The after treatment of the negatives in radiography does not differ in any way from the after treatment of negatives in ordinary photography. Intensification, reduction, enlarging as well as reducing involve the same processes, and further details pertaining to it may readily be obtained from any book on photography.

Probably the most difficult phase of radio-photography is the determination of the proper exposure. In ordinary photography we have only to consider the intensity of the light and this can readily be obtained. Knowing the speed of the lens as well as of the plate or film employed we in most cases are enabled to produce a fairly satisfactory negative. Not so in radiography. Besides knowing the intensity of the ray it is quite essential to also know its penetrating power, the distance of the tube from the plate, (this distance is measured from the target of the tube) thickness of the body to be radiographed. Thus owing to so many factors which enter the determination of the exposure its correctness is a rather difficult problem to solve. From time to time we may run across some formulæ which upon substitution of the proper factors will give a final result which in a measure would be the correct exposure. These formulæ may have some merit, but experience has taught that they are not absolutely reliable.

Before taking up one of these formulæ and discussing the same, it might not be amiss to acquaint ourselves somewhat with the various factors which enter such a formula. To begin with, the current in an X-Ray tube circuit, is measured by units called milli-ampères, which is one thousandth of an ampère, and is usually read directly from an instrument called the milli-ammeter, in series with the circuit.

The second item is the voltage, or the pressure of the current, and is measured by the distance which an electric

spark will jump to short circuit an X-Ray tube. The back-up as this distance is commonly called will approximately be 20,000 volts to jump one inch between fairly sharp points. Additional voltages are as follows:—

35,000	volts	to	jump	2	in.
45,000	"	"	"	3	"
55,000	"	"	"	4	"
65,000	"	"	"	5	"
70,000	"	"	"	6	"

As a rule there is a direct reading voltmeter in parallel with the circuit from which the direct voltage or pressure may readily be determined. Still it has been found advisable to check these readings by actually measuring the spark gap. In addition to the above factors the intensity of the X-Ray plays a very important part in the determination of the length of the exposure. It has been found that the intensity of the X-Ray varies inversely as the square of the distance from the target; thus if the tube is two feet from the plate upon doubling this distance we reduce the intensity of the ray to one quarter. Similarly if the distance is tripled the intensity will be one-ninth of the original intensity. Hence the complete exposure of a radiograph may be given in terms of inches of spark gap (back-up), milli-ampères of current, seconds of time and inches of distance. If the parts to be radiographed are of uniform size and thickness for a great length of time, the distance and spark-gap being the same, the average exposure may be expressed in terms of milli-ampère-seconds and time: $E = \text{Exposure}$; $M. A. = \text{Milli-Ampères}$; $S = \text{Seconds Time}$. Or

$$E = M. A. S. \text{ in seconds.}$$

It has further been found the reaction produced on a photographic plate by the X-Ray varied directly as the current and the time, i. e., an increase in either one of these factors will cause a proportionate increase in the photographic reaction. Let us for example assume that for a given negative a correct result is obtained by having the tube at a certain distance from the body, the back-up and the milli-ampères all correctly computed. The same result may be obtained by giving an exposure of half the time provided we double the milli-ampères, and so on any desired time may be obtained



STONE IN THE KIDNEY.

Illustrating article "Photography as Applied to Radiography," by S. A. Schwarz.

provided we make a proportionate increase in the milli-
amperage.

Taking a concrete example let us assume the following:
Conditions:—

Distance = 20 inches

M. A. = 20

Spark = 3 inches

Correct exposure time = 12 sec. Required: The exposure time if the distance is changed to 15 inches, no other factors being changed.

$$12 : X = 20^2 : 15^2$$

The product of the means being equal to the product of the extremes we have:—

$$400X = 12 \times 225$$

Solving for X we have:—

$$X = 6\frac{3}{4} \text{ seconds.}$$

Problem No. 2.

What would be the correct exposure if the current were doubled?

Taking the original example as given above we have: Since doubling the current doubles the intensity of the ray the time requirement for the exposure will only be one half, in other words the correct exposure will be 6 seconds.

In conclusion it may be said that although these various formulæ and other methods will to a certain degree help the Roentgenologist to determine roughly the time of exposure, yet in this field as well as any other field of photography, the truly successful operator is he who obtains his results from continued practice and experience.



DOROTHY.

CHAMPLAIN STUDIO.

DESENSITIZING

By HENRY F. RAESS



IN the fall of 1920 Dr. Lueppo-Cramer electrified the photographic world by announcing that he had discovered a method whereby he could develop panchromatic plates (or emulsions) by weak candle light. This appeared so revolutionary as to be almost unbelievable. The Doctor made no secret of his work, but generously published it to the world. The discovery was partly due to an accident. It appears that a dry plate manufacturer occasionally was annoyed with spots on some of his plates. The same emulsion on films caused no trouble. Microscopic examination showed that the spots consisted of a black dust particle surrounded by a light field. Moistening a spot with sulphuric acid and observing it under the microscope the black spot was seen to become ruby red. This indicated that the particle was some coloring matter (or dye stuff). But the origin of this still remained a mystery. The polishing and coating machines were examined. Changes were made in the clothing of the personnel, and even the latter were changed where they were directly connected with the coating of the plates. But still the spots persisted.

Dr. Lueppo-Cramer was responsible for their elimination, and as he said they gave him no rest in the day and no sleep at night. It was customary to pile the plates ready for coating in lots of fifty and put them into a cardboard box. After coating the upper plate always showed the spots, but not the other forty-nine. Examining the cover showed that a strip of black calico was glued to the inside and this was then covered with white paper. The plates had gradually worn away the paper in places leaving the cloth bare. Minute particles of this cloth settled on the plate and caused these spots. And this coloring matter was then the first desensitizer. The strange behavior of the dye stuff led Dr. Lueppo-Cramer to try the action of solutions of a number of dyes on plates after exposure and before and during development. He found that



THE SUNLIT ROAD.

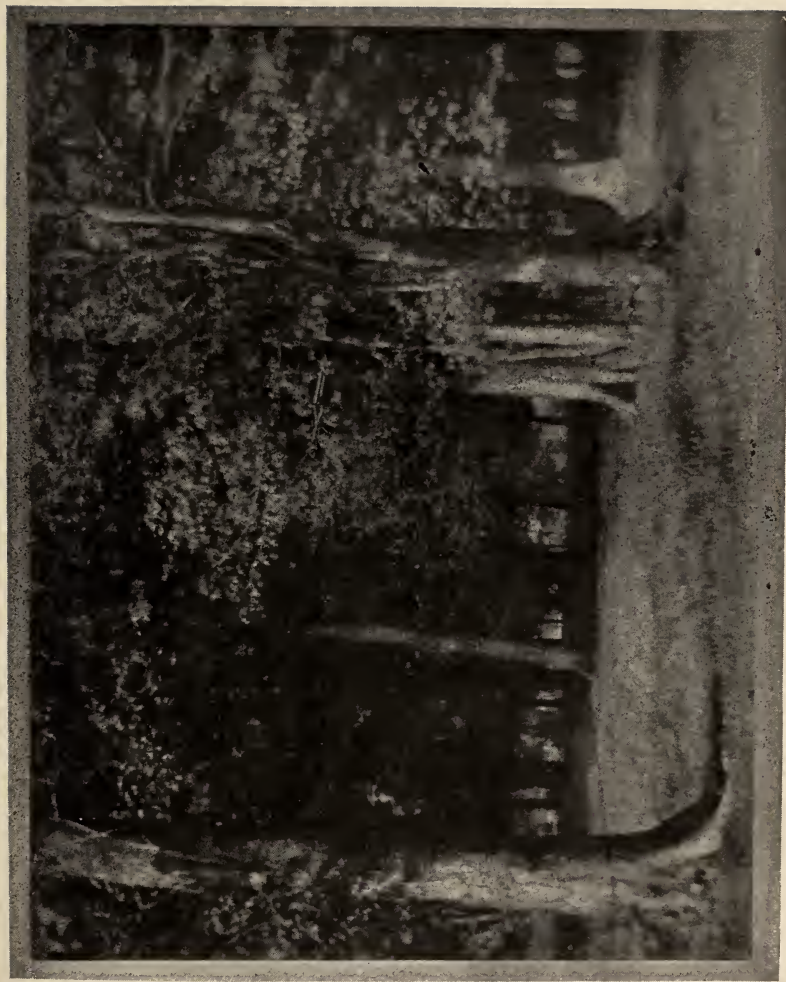
LAWRENCE BAKER.

the sensitiveness of the emulsion to light had been very much reduced and a much brighter light could be used during development.

Phenosafranine gave the best results. One part of this red dye was dissolved in two hundred parts of ethyl alcohol and distilled water added to make solution 1 to 2000 (about four grains per pint) and 5 c.c. added to 100 c.c. of developer (about two drams in five ounces). After placing the plate in this mixture for one minute the development can be finished in bright yellow light, or even by candle light at six feet. Even panchromatic plates can be so developed. The dye being red it was thought that possibly it acted as a screen. Other dyes were tried including blue, and it was found that also some of the latter possessed this property although not so pronounced. Further investigation showed that the dyes had a chemical action on the emulsion and so caused the reduction in sensitiveness.

Instead of adding the phenosafranine to the developer it can also be used as a preliminary bath before development. The importance of this method of development will be appreciated by those who have to work with panchromatic emulsions as heretofore it was necessary to carry out all manipulations with panchromatic plates until they were fixed; in either total darkness or in a certain green light which emitted rays between about 5100 A. U. and 5400 A. U. This is in the blue-green region of the spectrum and is the so called "safe light," but it takes some time for the eye to become accustomed to it as it is very weak. But even this "safe light" will soon cause fog with some emulsion, so it must be used with care. The reason for the comparative insensitiveness of panchromatic emulsions to this region of the spectrum is that the majority of the panchromatic sensitizers in use show but little absorption for this color, and so an insufficient amount of light is transmitted to effect the emulsion.

But this was not Dr. Lueppo-Cramer's first work along these lines. He had noticed as early as 1901 that the sensitiveness of plates was greatly reduced when in certain developers, especially those belonging to the paramidophenol class. Plates could be developed in these developers in a light so bright that when hydrochinone was substituted they were hopelessly



INTO THE DEEP WOOD.

W. H. Porterfield.

fogged. Later Dr. Lueppo-Cramer found that aqueous solutions of certain developing agents had a similar but far stronger action in reducing the sensitiveness. At the present time diamidophenol hydrochloride (Amidol) and triamidobenzol hydrochloride are the only substances possessing this property to a practical degree that are not dye stuffs.

The most effective was a 0.05 per cent. solution of Amidol in distilled water without any other admixture. The plate after exposure was placed in the above solution for one minute in darkness and then developed with one of the usual developers excepting glycine which caused a dichroic fog. Another plate having the same exposure but not treated was placed in the developer at the same time and both developed in bright yellow light. The plate which had not been treated became badly fogged, while the other remained clear. Orthochromatic plates showed but little difference between the treated and untreated plates; they both rapidly fogged. The above experiments were repeated by the writer, using lights of three different luminosities. A ruby light such as used for developing the average fast plate, an orange light used for developing "gas light" papers, and a bright yellow light which would not be safe even for the slowest developing papers. The developer was a metol-hydro, as used by the writer for all his photographic work with plates and papers excepting line work. The developer is so adjusted that it requires seven minutes at 65 degrees Fahrenheit to properly develop a fast plate. A 0.05 per cent (about two grains in seven ounces) solution of Amidol in distilled water was used as a preliminary bath. Fast and medium speed plates, ortho and panchromatic plates were tried. The latter were first tested for red sensitiveness as all so-called panchromatic emulsions are not always so. In all cases two plates were exposed and for the same length of time. One plate was then bathed for one minute in the Amidol solution in darkness and then slightly rinsed. Both plates were then placed in the developer about two feet from the light. The treated fast and medium speed plates remained clear but the others became badly fogged when using the bright yellow light. The treated ortho plates remained clear in the orange light but fogged in the bright yellow light,

and the panchromatic plate fogged in the red light unless treated.

The phenosafranine solution made as above was then tried. All plates, even the very red sensitive emulsion, remained clear in the bright yellow light after allowing the solution to act for one minute in darkness. The results were the same whether the phenosafranine was used as a preliminary bath, or added to the developer. In conclusion, we would say this: the phenosafranine method is far more practical than the Amidol, as it was found that the action of the developer on the Amidol treated plates had been so greatly accelerated that unless the emulsion was very fresh a considerable chemical fog was produced even when the plate was developed in darkness. Dr. Lueppo-Cramer's statement that the presence of sulphite in the Amidol solution destroyed the latter's peculiar property of desensitizing was verified. In some cases the phenosafranine has a tendency of slightly staining the gelatine a reddish color, especially if it is used as a preliminary bath.

While the stain is not objectionable, it can be easily removed by placing the plate after fixing and washing a short time for a few minutes in a strong solution of alum containing a small quantity of pure hydrochloric acid and washing again. The presence of the phenosafranine in the developer does not cause any deterioration in either fresh or used developer even after some months. In other words, it is perfectly safe to add the dye to the stock developer.



PONTIFICAL HIGH MASS.

JULIEN J. PROSKAUER.

ZOO PHOTOGRAPHY

By ARTHUR H. FARROW



FROM the days of childhood pictures of wild animals have interested most of us. There are few amateur photographers who have not yearned for an opportunity to make animal studies. But all of us cannot go to foreign lands, and the gratification of portraying wild animals in their native haunts comes to about one photographer in thousands—the rest have to depend upon animals in captivity for their subjects.

The Zoo has a particular fascination for young and old, but it makes an especial appeal to the amateur photographer as a prolific field rich in possibilities for interesting pictorial studies. Close to the delight of seeing strange animals and birds lies the joy of making pictures of them. If there is one place where the camera can be utilized at all seasons of the year, a place where it can easily be made a source of pleasure and profit, that place is the Zoological Park.

There is also a sporting element attached to this branch of photography that is particularly appealing to every red-blooded individual.

Scattered throughout this broad land of ours are a number of excellent Zoological Parks of which we can well be proud. The largest and most representative, perhaps, is the one at Bronx Park, New York City, but the amateur photographer who aspires to take pictures here is doomed to disappointment. As one is about to pass through the turnstile at the entrance he is greeted with a conspicuous sign giving notice that "No cameras are allowed".

One is at a loss to understand just why the management persists in this policy of prohibiting the use of cameras, in spite of vigorous protests, but, unfortunately for us, the fact remains that they do.

My impression is that the main purpose of a zoological collection is an educational one; to further the study of natural



A WINTER SCENE IN THE DEER PADDOCK.

Illustrating article "Zoo Photography," by Arthur H. Farrow.

history and to enable the lover of birds and animals to become better acquainted with representative foreign and domestic species. One would think if this were really the case, everything would be done to encourage an interest in this direction, and what better means is there for furthering this interest than that which the camera affords of making lasting photographic records of the denizens of the Zoo.

I have been to the Bronx Park Zoo many times, but have always come away disappointed at not being able to use the camera. Of course, small cameras are smuggled in and exposures made surreptitiously with them, but this kind of photographic work is not satisfactory, and one does not get any real pleasure from it.

If the reason for prohibiting the cameras is a mercenary one, (and it is the only one I can think of), why not charge a nominal fee, say fifty cents, for a permit to take pictures? This would be willingly paid by serious workers, and the revenue derived would more than offset any loss occasioned through the non-purchase of picture postcards and illustrated literature.

Happily for camera devotees, this deplorable policy is the exception and not the rule at other Zoological Parks in this country. At most of them no restriction whatever is placed upon the use of hand cameras. In fact, one is permitted to photograph as much as one likes, providing the animals are not molested or unnecessarily disturbed or annoyed.

During the past few months the writer has been a frequent visitor at the excellent Zoo at Cincinnati, Ohio, and here one can photograph to one's heart's content, and facilities are afforded for the purchase of films and other photographic supplies.

Zoo photography is intensely interesting work and will well repay the time and effort devoted to it, but even with all restrictions regarding the use of the camera removed, one must not think it is an easy matter to obtain good pictures. It is not; difficulties will be encountered that will tax the energy of the most enthusiastic. A considerable amount of ingenuity is required to obtain worth-while pictures. It is to be understood that just to point the camera at the subject



MR. PELICAN OBLIGINGLY POSES.

Illustrating article "Zoo Photography," by Arthur H. Farrow.

and make the exposure is not all that is necessary if successful photographs are desired.

The main essentials for success are, a good lens, a quick eye, and as much attention to composition and other details as the case will allow. Great patience and careful observation must be devoted to securing effective poses, good lighting and appropriate backgrounds.

Animals in captivity are very restless and continually on the move. To obtain successful pictures of them one must combine patience with quickness to seize the most favorable moment for making the exposure. A long-focus lens, or even a telephoto, will often be found useful in dealing with creatures difficult to approach at close quarters, or such as are small. A very low viewpoint is often an advantage, but care must be taken that no near foreground objects obscure the actual object.

Most of the popular makes of hand cameras are adapted for the purpose. The best outfit that can be purchased is none too good, although not absolutely necessary. Much good work can be done with a camera such as the ordinary amateur uses. Of course, the Graflex is well fitted for the work; but it has the disadvantage of being cumbersome and conspicuous, and the price is prohibitive for the average worker. After mature consideration and from practical experience, I have come to the conclusion that an Ansco Speedex No. 3, fitted with an F/4.5 lens, is an ideal instrument for this particular work. It is a real pocket camera, extremely simple in operation and extraordinarily efficient. The large aperture anastigmat lens enables one to make snapshots under the most unfavorable conditions, and the full measure of such occasions will be encountered in serious Zoo photography. The $2\frac{1}{4}$ in. x $3\frac{1}{4}$ in. size picture is about the smallest that can be adequately used in the album. It is well adapted for making lantern slides, and the correctly-timed negative enlarges satisfactorily.

Zoo subjects are particularly effective when rendered in the form of stereoscopic pictures, but like the Graflex, a stereoscopic camera is rather bulky and somewhat limited in its use in this field of endeavor.

Sometimes it is an extremely easy matter to make a good



STILL LIFE STUDY.
CHRIST OR MAMMON.

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photograph of a bird or an animal, then again it may prove to be the most difficult and exasperating task to get just what one wants. The only thing is not to be discouraged by failures—one will get plenty of them—but keep on trying until success is achieved. If one desires to obtain a representative collection of Zoo pictures it will be necessary to make many visits. The habits and characteristics of the various subjects must be studied. The better acquainted one gets with the animals, the keepers and conditions, the possibilities and limitations, the better chance for success.

The most desirable, perhaps, of all Zoo subjects are the great cats—lions, tigers, leopards, but the likelihood of securing good pictures of them is very uncertain. About the only way is to place the lens of the camera through the bars of the cages, but it is only on rare occasions a satisfactory picture can be secured in this manner. There are times, however, when the animals are using their outdoor cages, and when the light is favorable, that this can be done. Make friends with the keepers and usually a way will be found to get the picture you want.

The water-fowl, pelicans, swans and ducks, are always attractive and usually very accessible. If one watches carefully and waits patiently for interesting and characteristic poses, opportunities will occur for making pleasing studies. The cages in which small animals and birds are confined are usually made of fine meshed wire. A fact that is not generally known is that one or two wires directly across the front of the lens does not make any appreciable difference in the resultant picture, providing the wires are right up against the lens and do not cast any image on the plate or film. Thus, a fairly large mesh does not do any real harm.

In making your visits to the Zoo, avoid crowded days. Select a time when there is likely to be few visitors. Experience will teach which hours are best for different subjects. Some subjects can be best secured in the morning, others later in the day. A lot depends on the position of the cages.

I hope that this comparatively new field in which very little really serious work has been done will be accorded consideration by amateur photographers, especially those who are also nature lovers.

THE BROMIDE PRINT—A MEANS NOT AN END

By WILLIAM ALEXANDER ALCOCK, L.I.B.

 O the great majority of casual photographers, who regard the bromide enlargement as the Ultima Thule in photography (and I am afraid they constitute the great army of those who keep the photographic stock-houses busy) it will perhaps be news that many serious pictorialists are ever seeking ways to improve and modify the result which this process gives.

In my contribution to the last issue of this *Annual*, I adverted at some length to the bromoil process, a process which in the hands of the enthusiast is hard to equal, and almost impossible to excel. But to many who have tried it discouragement and failure have been the portion. To such I say try again, and perhaps a few suggestions in the matter of working details may be of assistance.

Try the following developer:

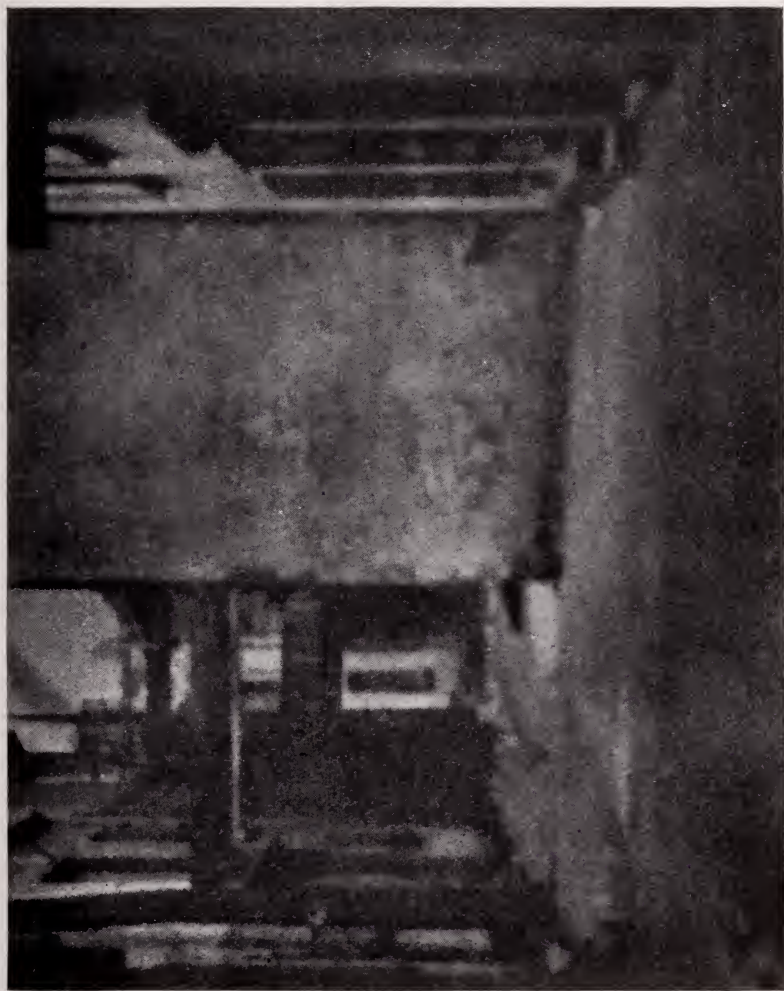
Water	20 oz.
Sulphite of soda (Anhydrous).....	$\frac{3}{4}$ oz.
Amidol	50 grs.
Potassium Bromide.....	10 grs.
Bi-Sulphite of soda.....	50 grs.

Use the developer immediately after it has been compounded and use fresh developer for each print. If an 11 x 14 print be soaked in water for forty-five seconds before development, an ounce of the foregoing solution will be ample.

Expose the print so that it begins to appear in the developer in about 30 seconds and develops fully in four minutes. Rinse the print. Fix it for ten minutes in the following bath, freshly compounded:

Water	20 oz.
Hypo	2 oz.
Sodium bisulphite	200 grs.

After fixing wash for ten minutes and dry the print.



AN ANCIENT AMERICAN THOROUGHFARE.
Bromoil.

WILLIAM ALEXANDER ALCOCK.

It may be bleached at any time within reason, and I have found that I have no difficulty in inking a print one year old at the time of bleaching.

There are numerous—almost innumerable—formulae for the bleach. The S. H. Williams bleacher, which can be bought in the supply-houses and only needs to be diluted to one-third of its strength, is as good as any and saves work. It has the additional advantage of requiring no sulphuric acid bath after bleaching, the print being fixed for five minutes in a 5% hypo bath, washed for ten minutes and dried. It is then ready for soaking and will keep indefinitely.

A very pleasing and exceedingly interesting method of after treatment of a bromide print is to make a bromoil transfer. This is done by making a bromoil print in the manner above indicated and then super-imposing on the bromoil a sheet of good paper such as Michallet or Whatman, or one of the Japan Paper Company papers, passing the two sheets through a wringer and peeling them apart, when the image will be found to have transferred itself from the bromide paper on to the other. This gives a print closely approximating a lithograph and enables one to dispense with the usually undesirable heavily coated gelatine surface of the bromide print. I have found that a wooden wringer—a mangle—made by the American Wringer Company, gives equally as good results as does an expensive etching press, while in addition it is a very useful household appliance.

The space at my disposal prevents me from doing more than touch the high spots.

I should like to dwell upon carbros, a very simple method by which a carbon print may be made from a bromide, but the full details of working this process have been published by the Autotype Company and may be obtained from George Murphy, Inc., New York, the American agents.

A very charming method of modifying a bromide print is to give it a gum coating, not as with platinum by registering and printing, but by chemical action alone. This process was worked out by Mr. T. H. Greenall, and described by him in our British contemporary, *The Amateur Photographer*, in the issue of February 12, 1919.

This comparatively unknown process is simple and inex-



A LONELY VIGIL.
Palladium Print.

WILLIAM ALEXANDER ALCOCK.

pensive and is described in detail in Wall's Dictionary, Tenth Edition. The worker who is seeking the unusual will do well to investigate this method of treatment.



JUNK FOR SALE.

WILLIAM ALEXANDER ALCOCK.

THE SUN IN THE PICTURE

By HORACE SYKES



WHEN I first learned to make photographs—that is, how to manipulate the camera, develop plates, and make satisfactory prints—the novelty of the various processes, the charm of the ground-glass, and the fascination of seeing the image appear from nothingness, lured me on at first and absorbed me. I made photographs literally by the roll and by the pack. I immortalized absolutely everything from the back-yard fence to my best girl's family.

At length this sort of thing became burdensome to my pocket-book. My interest began to wane. I grew tired of simply multiplying prints. I reached a stage where I found myself looking over great bunches of old photographs and wondering why I ever took them, what on earth I saw in that old stump patch or pile of rocks to induce me to waste a film on it. Eventually the simple mechanical and chemical manipulations ceased to absorb me as they had done. I reached a point where I longed to make more than just ordinary snapshots.

I noticed that some photographs were more greatly admired than others, that some prints had a far more lasting interest. As I sorted out and culled, some prints seemed to continually find their way back among the chosen, and I began to realize that they possessed something that the others did not. They were different. The fact that they were pictures, while the others were merely photographs, began to manifest itself and I commenced to seek the reason why.

It was at this point that I began to grope about and reach out for that something which makes photographs into real pictures. I commenced to study pictures that pleased me, and to attempt to analyze recognized pictures by other photographers. At first the thing seemed hopeless, but presently I discovered one fact that became a great help to me. The fact

that any unusually attractive aspect or mood of nature is equally attractive in a picture. Accordingly I began to watch for the unusual and to attempt to photograph it. This led me to do many bold and daring things photographically speaking, to take some desperate chances. I remember that when I once told a photographer friend of the old cut and dried type, that I contemplated taking pictures with the image of the sun in them, he advised me not to be so foolish.

I did not take his advice, and I was not altogether foolish either, although my first efforts were far from successful, or are my present efforts always so. I have, however, made many good sun pictures, found it to be a very interesting as well as different subject, and will reveal a few of the things I have learned about it.

There is a great difference in the behavior of lenses when it comes to working head on into the sun. There are comparatively few that will render an image that is clear and free from spots, rainbows, etc., due to the reflections from the internal glass surfaces. It is my observation that in general the cemented lenses are superior to the air space lenses in this respect.

The next thing I learned was that there is not much difference between the various makes of plates and films in doing this class of work. What I consider my very best sun picture, "Sun and Sea" (Figure 1), was taken on a cheap single coated plate. I cannot say that I have found double-coated or other non-halation plates to be of any great advantage.

It required a long time for me to learn that the ray filter is of little value. I am quite sure that it actually spoiled some of my exposures that would otherwise have been successful.

It is the subject matter itself, the condition or quality of the light, the condition of the atmosphere and sky that are the controlling factors. I have learned that the lens and plate cannot, as a practical thing, record successfully extremes of light which are greater than the eye can comfortably discern. In other words, if the sun is partly obscured by smoke, haze, fog, clouds, or the deep color of sunset so one can look at it with the unaided eye without discomfort the plate can record it without becoming mussed up with halation and lens reflections. Success depends therefore not



SUN AND SEA.

Figure 1.
Illustrating article "The Sun in the Picture," by Horace Sykes.

so much on the equipment or methods as on close observation of the subject, and making the exposure at the critical moment.

The matter of exposure should also be mentioned. The natural thing to do is underexpose. Because of the apparent intensity of the light one will naturally shorten the time. It must be remembered that the lens sees only the shadow side of what is before it, and that a fairly full exposure is necessary. My most successful exposures have been from a twenty-fifth to a hundredth part of a second at an average stop of F 6/8.

I use only tank development for both plates and films, and believe it to be one of the essentials in this fascinating work. My prints and enlargements are made in the usual manner. For the sake of brevity I have not attempted to tell all I know about this interesting subject. The fact is I learn something new almost every time I attempt it. I have given a few brief hints which I hope will encourage and help others to start.

I wish to state in concluding that the two illustrations (Figures 1 and 2) are the result of simple straight photography. Neither the negative nor the print has been faked in any way.

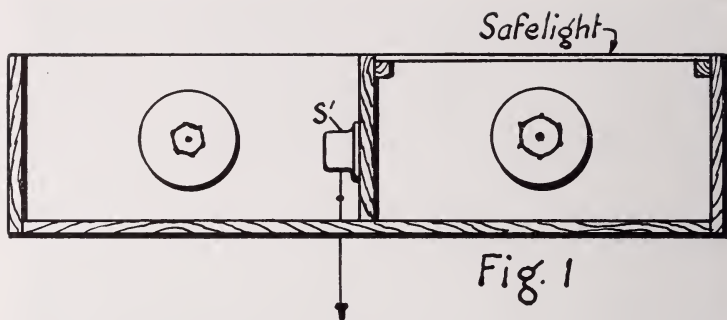


ANCHORED.

THOMAS CARLYLE.



DECEMBER EVENING. Figure 2.
Illustrating article "The Sun in the Picture," by Horace Sykes.



Illustrating article "Taking the Dark Out of the Dark-Room," by August Krug.

TAKING THE DARK OUT OF THE DARK-ROOM

By AUGUST KRUG

NOT so many years ago the average dark-room was a place of Stygian blackness: a feeble red light faintly illuminated a space about the size of an eight-by-ten tray and in addition probably exhaled an asphyxiating odor, due to a combination of burning paint and half-consumed kerosene. The electric dark-room light is now universal, and explosions no longer interrupt the peaceful quiet as we develop our plates: but "inefficient" is the mildest word that can be applied to most of the lamps.

This article will tell about a lamp which was made and installed in our dark-room. It has aroused the wonder of all who have seen it; the invariable query is, "But can it be safe?" It is. Portrait films are developed by its light; every object in the room can be distinctly seen; solutions can be made up in any part of the room, which is sixteen feet square; newspapers can be read comfortably by its light, and it is so soft that there is no eye-strain after an all-day session in the dark-room. In fact, we are thinking seriously of not calling it the "dark-room" any more.

Of course, it is an indirect light, because no direct source of illumination could do all that. The light box is suspended



THE PORTAL.

AUGUST KRUG.

from the center of the ceiling, hanging down about eighteen inches. The ceiling and part of the side walls are kalsomined white, the remainder, about five feet up from the floor, is painted chocolate color, being easier to clean and not showing pyro stains. The ceiling becomes the source of light, an area of about eight square feet sending well diffused illumination over the whole room.

The drawing (Figure 1) shows the construction of the box. It is divided by a vertical partition through the center, giving two boxes of equal capacity. It is lined with tin or galvanized iron painted and enameled white. Three lights are installed, two of these go in the side which is later covered with the safelight, one being installed at each end, the other goes into the white-light side. The safelight used is determined by the character of work done: the Wratten No. 2 is suitable for most.

The unique feature of the light is that it can instantly be changed from red to white or from white back to the safelight, simply by pulling on the cord which hangs pendant from the box. Turning on one light automatically turns off the other, and the process can be repeated indefinitely. The main control switch, which turns the light on and off, is situated near the dark-room entrance, and of course works independently of the other switches.

The switches marked S and S' in the drawing (Figure 2) are what are known as 'pull chain switches', and they are connected up as shown in the wiring diagram. They are arranged so that one is "off" while the other is "on". The chains are made of equal length, and tied together at the ends with a single cord, which is then led through the bottom of the box. It may have a radiant tip if desired. It is suggested that the switches be located in the white light side of the box, so that adjustments can be made without difficulty. There is, of course, no reason why a different kind of safelight should not be installed over what we have termed the "white-light" side of the box: as, for instance, one of clear yellow glass for use when printing gaslight papers.

Our equipment consists of a 200-watt type C mazda lamp in the white light side, and two ordinary 100-watt tungstens in the safelight side. It is not possible to use gas filled lamps

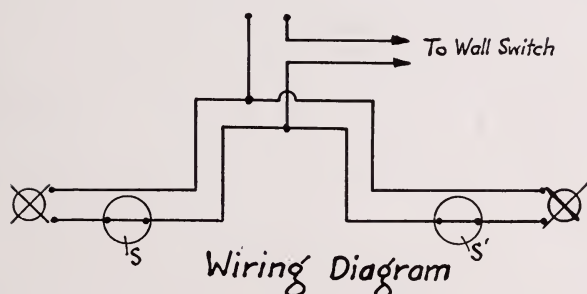
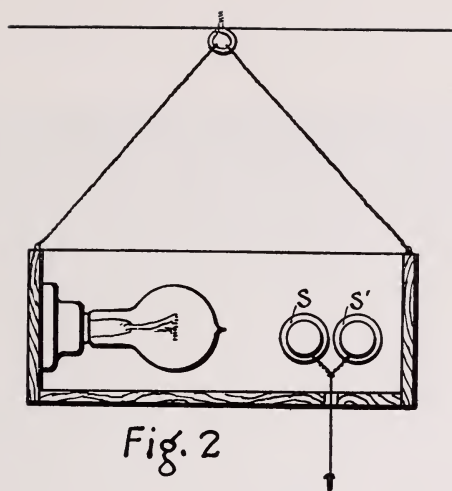


Figure 2.

in this side, on account of the heat generated. Perhaps the wattage mentioned would be excessive for smaller rooms, but it is a comfort to be able to work in a room in which everything is distinctly visible.

Exact dimensions are not given, because the worker who decides to make himself one of these lights must figure them out for himself. Nor have I prepared the customary itemized cost-sheet, showing how economically it can be made, believing that the comfort gained by the use of the light cannot be measured in terms of dollars and cents. When you have taken the dark out of your dark-room, you will like the result so much that you, too, will want to pass the idea on to others, as I have tried to do.

THEN AND NOW

By C. H. CLAUDY



YOU are invited to take a walk with me . . . a photographic walk. We are going picture hunting, you and I, to see what of beauty or of interest we can pick up.

Only first we are going to turn the clock back forty-eleven years.

While I lug our portable camera, which weighs only sixty pounds, out on the porch, do you go to the barn and get the travelling dark room. It is nicely mounted on a push cart. I'll have the hired girl bring out a few buckets of water to put in it, and also get the tripod and the plates and holders. And don't forget the kerosene.

All set? Let's go. Isn't it nice and light. Two healthy girls could push this nice light little push cart around the landscape. It's only a few hundred pounds on wheels, a few pounds of glass and chemicals, some water, a nice little camera about as big as an egg crate and a lens which looks like a cross between a French 75 shell and a thermos bottle.

Really, it's nothing . . . look at the artist. He has to carry an easel and canvass and paints and brushes and a camp stool, and when he gets where he is going he has to spend all afternoon at the job, and *then* he doesn't get anything, much. While we . . . say, how is that? Look at that stream, and those overhanging trees; man, I know you are hot, but why stop to mop your face when you can look at a landscape like *that*?

Now, do you set up the tripod, and I'll give you a lift with the camera, and then you focus and I'll prepare the plates. You see, I'm willing to do the hot work. Sticking head and shoulders into the little dark-room, and being all fastened in with a tight cloth bag tied around my waist, is hot, but who minds a little discomfort like that? The kerosene dark-room lamp is hot and smelly, too . . . you didn't forget to bring the kerosene, did you?

I dare say I speak in a somewhat smothered voice, due to



BETH BERI AS "THE GYPSY."

Louis Fleckenstein.

my being all prisoned up. "You pretty nearly ready? I am . . ."

I come out, somewhat hot and little disheveled. But my precious wet plate is very wet indeed, and you are all ready, thank goodness, and so we proceed to make the picture, giving several seconds exposure. Then I wish on you the job of developing the plate. You find it hot and smelly and muggy in there, but as you are progressing you begin to shout at me: . . . "Hi, Carl. This is a wonderful negative. Most remarkable detail and absolutely perfect exposure . . ."

It is true. We have made a perfectly bully negative. And it has only taken us an hour or so of light, easy work. All we have to do is to pack up the outfit and move it some more dusty miles, and prepare another wet plate and set up and take down a nice little light camera which weighs a ton at the end of the trip, and when we come home in the evening we'll have three or four wonderful pictures.

"Look at that drawing," you say. "What about your old artist *now*? Isn't science *wonderful*? Think of being able to do all this in an afternoon, and with only the little labor we had."

It is true . . . it is, or rather was, wonderful. But let's jump back to 1921.

If you go for a photographic walk with me you slip into your pocket a V. P. K. or carry a Three A in your hand, dangling . . . maybe you allow yourself the luxury of a case and strap. Me? I carry a panoram, just so we won't both shoot the same sort of views. In your pocket are two or three rolls of film, weighing altogether almost as much as a nice red apple you have in the other pocket. When we make pictures we use a fence post, tree stump or old box, if we have to have a tripod, but usually we don't. The E. K. people make the little screw dingus that helps us attach our instrument anywhere, but we make most of our pictures in from a twenty-fifth to a hundredth of a second.

We don't know anything about travelling dark-rooms. We never saw one, either of us. I have seen wet plates prepared, in a photo engraving plant . . . you perhaps hardly know what "wet plate" means. We don't have to bother with plates, wet or dry . . . we don't have any plate holders. We know not the

focussing cloth. Our entire outfit is so small and light that we get footsore, if footsore at all, from the miles we travel, not from the weight we tote.

When we return, we develop our roll of film in a tank while we eat supper, and still we don't bother with lamps of any kind, let alone smelly kerosene ones. At the end of the day you have sixteen perfect little pictures and I six or eight long panoramic pictures taking in a view of a hundred and some degrees each.

It's a long, long way from forty eleven years ago. The big lens has become little. The huge camera has shrunk to one which goes in the pocket. The tripod is a tiny fixture, the dark-room has gone, the glass plate has been changed into film, its wet emulsion dried and rolled up into a little cylinder which goes into the pocket.

Let us give credit where credit is due. Our ancient forbears who followed Daguerre builded better than they knew . . . for in spite of what would be to us today insuperable difficulties, they brought before a waiting world so much of the wonder and romance of photography that the waiting world expressed itself as willing and ready to pay for that same romance if it could be made a little more portable.

Then the kodak, roll film, the developing tank, the modern lens, manufacturing methods which reduced the price of the whole to within the range of the most modest pocketbook, and a system of sensitive-product distribution which makes it possible to buy film anywhere in the world . . . and we have modern photography.

What? Well, I'll say I haven't told the half. Our forebears printed slowly and with difficulty on home-made albumen paper . . . we do it by lamp light in a moment. They either made their own chemicals or waited weeks to get an order through to a stockhouse . . . we have ours served pure and cheap at any supply store. They had to identify their negatives by notes . . . we make our notes *via* autographic film at the same time we make the negative. They knew only one method of enlarging . . . to photograph the photograph. We use V. P. negatives in an inexpensive enlarger and print enlargements at home as fast and as good as contact prints. They used a cap . . . we have an automatic shutter.

No, there isn't any moral. Only, some day when the shutter won't work or the negatives are not properly exposed, or you lose a roll from carelessness, or the cat walks over your pet print and you start in to say just what you think, remember what you and your forbears did in the name of photography and give thanks, instead of lurid lambastings, that you live in an age where photography is not only a magic and a wonder but a convenience.

Did you ever stop to think why "you press the button and we do the rest" does not make its former advertising appeal? It's because "the rest" is so easy, so pleasant and so fascinating that we refuse to pay some one to have all that fun for us which we might have for ourselves.



THE PICKET FENCE.

HOLMES I. METTEE

THE MULTIPLE GUM PROCESS

By FRANCIS ORVILLE LIBBY



AMONG photographers the making of prints by the superimposing of two or more layers of pigment on a piece of paper by the Gum Bichromate or Multiple Gum process has always been a sort of "Never Never" land of photographic printing, a mysterious process used and known by only a chosen few. I am going to try to show you that this should not be the case and that "Gum" is the simplest of all the so-called controlled processes for the serious worker with pictorial aspirations to use.

To begin with I want to say a few words about the results to be obtained in comparison with other methods of printing. I am not going to compare Gum with Bromide because the latter, fine as the results produced by this medium are, lacks the opportunity for control, and expression of individuality, which a process to be suited to the needs of the pictorialist should have. Platinum renders gradations in the highlights better than any other process, but is not so susceptible to control as Gum and does not give so rich a black as can be obtained with some other processes. Hand coated platinum with several printings is much better. The Carbon Process is rather laborious to handle and difficult in hot weather, but gives a beautiful richness in the shadows, and detail that is hard to equal, but is not nearly as easy to modify in contrast, either locally or totally, as Gum.

The Advantages of Gum Are:

1. Your choice of color and texture of paper support are practically unlimited.
2. Modifications of relative values are made more easily than in any other medium except Oil and Bromoil and as easily as in these.
3. The possibilities of modification of total contrast are unlimited.



YANKEE DOODLE.

FRANCIS ORVILLE LIBBY.

The Disadvantages of Gum Are:

1. That it is difficult and almost impossible to get exactly the same result on duplicate prints.
2. The process on account of its great flexibility appears difficult at the beginning. This apparent difficulty I hope to prove to you is not very real.
3. The rendition of very fine and intricate detail is almost impossible on account of the looseness of texture in a Gum print but this is rather an advantage than otherwise, as it tends to give a breadth to the picture it might not otherwise have.

Gum is not a process to be used in small sizes of pictures, but rather for the production of exhibition pictures, and those in which you desire to express something more than the limitations of the lens and plate have allowed you to get on your negative. It is a process for the impressionist, not the realist, and is for the man who has an idea to put in permanent form, an interpretation of some beautiful mood of nature, rather than for the man who is content to reproduce simply the facts as they lie before him.

Whistler, the painter, used to say that "Nature was never wholly perfect," but be that as it may, Art is certainly nature seen through the artist's eyes and interpreted through his temperament and individuality. The use of the Gum process will not make a picture for you, but if you have your story to tell, it will do its part and enable you to put it on paper in a permanent and beautiful form.

To begin with, the materials you will need: Paper of all sorts can be used, but probably the easiest to work and the most satisfactory in the long run, are the good grades of drawing and charcoal papers. I have made prints on tissue of various sorts, but unless I am after some particular effect for which it would not be suitable, I now use almost wholly the rough and smooth Arnold Drawing Papers, which are very satisfactory. The rough for very broad effects and the smooth for detail and delicacy. Practically all papers are best sized before coating with the sensitizing mixture as this will give you purer highlights, and for this you will need something to fill the pores of the paper. There are a number of things

that can be used, but my preference is for a gelatine size which I mix as follows:

Rub 6 gr. of Thymol in a mortar with 30 to 60 minims of 90% Alcohol until dissolved.

Add this to 20 oz. of water in a wide mouthed bottle.

Add 1 oz. Nelson's Shredded Gelatine.

Let it stand one hour or more and then dissolve in a water bath of not over 120 degrees and filter through muslin. Your size is now ready and will keep indefinitely and can be used any time by warming it up in a water bath. When I size I add to about an ounce of the size 10 or 12 drops of a saturated solution of Chrome Alum. This hardens the Gelatine and it will not dissolve if you should find it necessary to use hot water later on in developing the print.

Besides this you will need two other solutions:

One of Gum Arabic 2 oz. water 3 oz. and to each ounce of the gum solution should be added two or three drops of a 40% solution of Formaldehyde as a preservative. This I compound by putting the Gum Arabic in a piece of cheesecloth and suspending it in the water in a wide-mouthed vessel. It will dissolve in about two days.

The other is the sensitizing solution and it may be either a solution of Potassium, Ammonium or Sodium Bichromate. I have tried them all but have finally fixed on the following as by far the most satisfactory:

1½ oz. Ammonium Bichromate and 400 gr. Manganese Sulphate to 10 oz. water.

The addition of the Manganese Sulphate seems to have a tendency to hold the pigment to the paper and render it less likely to flake with a light printing.

All our preparations are now made and we are ready to start our printing. First, some evening we warm up the Gelatine size until it is liquid and then laying the paper we are going to use on a newspaper, or other clean surface, we brush the face of it with the liquid working first one way and then the other. Any good sized brush will do, and it is not necessary to be very particular except to be sure that the paper is all covered and the coating fairly uniform. Mark the back of the sheet and lay it flat on the floor or hang it up to dry.

This sizing is a quick job and from fifteen to twenty large pieces of paper can be coated in half an hour. After sizing, the paper can be put away until needed and is ready to use any time.

To print, take a piece of your sized paper and coat it with a mixture of Gum Solution, 1 dram, and Bichromate Solution, 2 drams, or one part to two parts, to which has been added pigment of whatever color you desire. The above proportions are right for the ordinary negative or straight print, but if you need more contrast use less Bichromate and add enough water to make up. If you require a flatter result add more Bichromate, keeping the solution of Gum and Sensitizer the same.

For pigment you may use many things: Moist water colors are good and the finely ground dry pigments such as can be bought at any painters' supply house are excellent. The only thing you must be sure of is that your color is not in the nature of a dye but is a true pigment, otherwise it will stain your paper and not remain on the surface as it should. For a few cents you can buy enough color to last you for a year. After trying everything I could find that I had heard of I have finally settled down to the use almost wholly of but a few kinds of pigment: Carter's Velvet Black, a show card color, for brown and warm black, Lamp Black where a colder black is desirable, Prussian Blue and Devoe's Dark Blue, another show card color for night effects or to modify the blacks. The Prussian Blue is a very strong brilliant color, a powder, and should be used sparingly and very thoroughly mixed, otherwise it has a tendency to streak, also the moist Oleo colors made by A. Sartorius, are particularly good.

With the above colors it is possible to get a great deal of variety, and they are about all you will need unless you want to experiment and try to produce prints in their natural colors. This I do not think desirable as Photography is essentially a monochromatic art. In Gum it is not easy to get a true black. The tendency with all the blacks is toward a brown. This is particularly true with the Ivory black and with this color you will obtain a very rich effect by leaving the Bichromate stain in the paper. If you desire to remove this stain it can be very easily done at any time by a bath of



AS IN THE DAYS OF PLATO.

W. H. Porterfield.

1 oz. of Alum to 20 oz. of water, or better still, a small quantity of Sodium Bisulphite in water, it is not necessary to be particular about the amount. I put two or three teaspoonfuls in a tray with about 60 oz. of water. However, if you use the alum bath before the last printing is made, you will find it has a tendency to shrink the paper. For applying the sensitizing mixture to the paper you should have a flat bristle brush about two inches wide, preferably set in rubber, though this is not necessary if you are careful in washing the brush after using, the bristles should be soft and fine but springy. A camel's hair brush is not good at all as it is too soft. This brush you will use in coating the paper, and you should also have what is called a Flat Badger Blender to smooth the coating and prevent brush marks and inequalities. The coating should be done with a moderately full brush going over the paper first one way and then across. The Blender is used holding it vertically above the paper and brushing rapidly to and fro just touching the tips of the hairs to the paper. There is a knack about coating, but it is not at all difficult after a little practice. The first coating is, on some papers, particularly the smooth surfaced ones, the hardest to get smooth and even, but slight variations in the evenness of the first coating, unless too bad can be easily taken care of in later printings. With rough papers or papers with a surface such as charcoal papers have, the coating is very easy. The coating may be done in the light of an ordinary room as the Bichromate is not sensitive until dry, but after coating the paper should be hung up in the dark to dry thoroughly, which will take twenty minutes or half an hour. Do not try to keep the sensitized paper too long before printing. The sooner it is printed after coating the better, as the Gum has a tendency to become insoluble if kept too long. This is also true after printing and it is best when possible to coat, print and develop the same day.

Your negative is all ready of course, so we can proceed to the printing: I use paper negatives wholly and have made them on P.M.C. Bromide No. 2 paper. Lately I have found another paper that I think will be even better, as it has less grain, none apparently; it is Artura Carbon Black Studio Special. With a negative of fair density and contrasts on

this paper the printing time will run from 10 to 30 minutes depending on the season of the year, and what you desire to get in your printing. If your negative has considerable contrast and you want to get a tint in the highlights, make your first printing long with a thin coating and build up the shadows in subsequent printings by giving shorter exposure and letting the highlights wash off after you have gotten them where you want them. I prefer fairly short printings myself, as I like to be able to start development just as soon as my paper has soaked long enough to be limp. If you have made an error in printing and given a very much too short exposure, so that the pigment comes off very unevenly or in places where you do not want it to come off, it is usually best to take a brush and remove all the coating, and on the other hand, if you have very much over printed and the pigment does not start at all after prolonged soaking quite often you can save the print by adding a little Ammonia to the water which you will find has a very marked softening effect on the coating. A weak solution of Sulphuric Acid in water is also good at times.

The amount of pigment which should be added to the Gum and Bichromate varies with the result you desire to obtain and somewhat with the pigment you are using. To 1 dram of Gum and 2 drams of Bichromate you will find 10 to 12 minims of, say the Velvet Black about right. This color is liquid being mixed with water and Glycerine. When the paper is coated it should appear a rather light, yellowish brown. In later printings you can use more pigment and it should but rarely be necessary to make more than four printings to get a scale ranging from the deepest blacks to white.

Print in direct sunlight and try an exposure of twenty minutes in the middle of the day. Be careful not to expose the paper to too strong a light when putting it in the frame or removing it as it is quite sensitive. The paper after exposure will show you quite a clear image if your coating has been light, but while it is possible to judge quite accurately by this image whether your printing is sufficient it requires practice and experience, so at first you had best simply expose for a certain length of time and then develop the print, and one or two trials will quickly give you the correct printing time.



J. ANTHONY BILL.

The whole principle of Gum Printing can be very simply stated. It is, that a colloid, in this case Gum Arabic which has been rendered more or less insoluble by the action of light on a sensitive salt such as Ammonium Bichromate holds the pigment on the surface of the paper in a greater or lesser degree depending on the extent to which the Gum has become insolubilized, hence the development of a print consists in washing off the pigment which has not become attached to the paper by the light action. A printed piece of paper may be developed automatically by immersing it in water, face downward, and leaving it until the pigment has washed off the paper. I do not advise automatic development, however, as working this way one has no opportunity for personal control and modifications of the image and values, which of course it is necessary for the pictorial worker to have. As I said before, print until after soaking in water until limp the color will begin to leave the paper upon the application of a stream of water. I use a short length of rubber hose attached to the faucet and start development with a moderately full, smooth flowing stream of cold water. The force of the stream and the volume of water to use is dependent on the action of the print. Sometimes you may need to use hot water and sometimes a spray will help. Nearly always you will need to use brushes and the most useful are a large round Camel's hair brush, a medium sized sable and a very small fine sable and two bristle brushes, one small and the other about one-half inch wide. The bristle brushes are necessary when you have to take the pigment off clean. When you have gotten your print to a satisfactory point, hang it up to dry.

I have said that multiple gum printing was the simplest of the controlled processes for the pictorial worker to use and this I believe to be a fact. However, for the very reason that it is capable of so much variation and control, though you will find that if you will adopt the method I have endeavored to outline you can produce prints at once, you will also find that you will not necessarily get the finished result just as you may desire to have it. That, however, will shortly come with practice and experience. Form a mental image of the picture you desire to produce before you start and work with that in mind all the time, and before you know it



"I WILL LIFT UP MINE EYES UNTO THE HILLS."

FRANCIS ORVILLE LIBBY.

you will find the process your obedient servant and that you can produce pictures instead of mere records of a pretty view. Birge Harrison says, "Nature, however beautiful, is not art. Art is natural beauty interpreted through human temperament," and Anderson says that "The aim of the artist must always be to arouse some emotional mood or sentiment." Bear these two sayings in mind. They are worth much thought and study and if upon consideration you find you agree with them, then you will want a process to work with that will not hamper you in the free expression of your ideas, such a process is Multiple Gum printing and I recommend it to your attention.



DAFFODILLS.

CHARLES D. MESERVEY.

SHUTTERS AND THEIR SPEEDS

By J. A. ERNEST ZIMMERMANN, B.S.



ARTICLES published from time to time in our photographic periodicals claiming that the shutter speeds $1/25$, $1/50$, $1/100$ are one and the same, seem to be accepted as trustworthy by most photographic workers as well as the novice of the art. If these speeds are practically the same, why do manufacturers label them thus?

The author could never understand such misrepresentation of facts as these and accordingly tested the shutter speeds of his apparatus. The work carried out and conclusions, arrived at in his own private laboratory, have led to the discovery that the three shutter speeds, which are apt to vary minute, fractional, parts of a second on one side or the other of the recorded speeds, are different and not of the same speed as asserted by various writers and authors. The process of these investigations, as conducted by means of a swinging pendulum of definite length through a short arc, is too intricate to be treated and published in the *Annual*. A different method, therefore, had to be devised which should prove and show the variance of the three speed conditions.

Selecting a cloudy but bright day, the experiment, which everyone can perform with a plate camera except the box type, was carried out. A reproduction of the negative which was obtained accompanies this article (Figure 1).

The author employed an 8 x 10 view camera, with grooves for holding opaque slides, cut in the side edges of the reversible back. This arrangement permitted him to obtain four different exposures on one plate, or Eastman flat film, by simply moving the opaque slides from one side to the other. Instead of using an apparatus with removable back and slides, a camera that does not possess this can be used as follows: A piece of heavy opaque paper—the size of the opening when the back is removed—is used. Cut one-fourth of the entire paper away, making right angles with the edges. This can

be used as the mask to obtain the four desired exposures to show whether the speeds are the same or whether the same vary. The four or three variant exposures should correspond to the method of analysis as outlined below.

From the reproduction given—which has been numbered from 1 to 4 to facilitate the pursuance of this analysis—it will readily be seen that number 1 is approximately one-half as dense as number 2; also number 3 is four times as dense as



No. 1. $1/100$ sec. exposure No. 3. $1/25$ sec. exposure.
No. 2. $1/50$ sec. exposure. No. 4. $1/5$ sec. exposure.

Figure 1.

number 1 and twice as dense as number 2. Number 1 received the exposure marked $1/100$; number 2 the exposure marked $1/50$; number 3 exposure $1/25$ and number 4 exposure $1/5$. One easily notices since number 2 is twice as dense as number 1, and that speed $1/100$ was used for 1 and speed $1/50$ for 2, that these speeds are in the ratio of 1 to 2, i.e., that $1/100$ is twice as fast as $1/50$. The same can be shown and proved with number 3 which is one-fourth as rapid as number 1, and one-half as fast as number 2. Number 1 compared with number 4 shows that it is twenty times the speed, the density of which was determined by means of a microscope as well as



A. McFarlin.

by the light law of inverse squares which gave the result of 19.83 times the intensity of number 1.

It is hoped by the author that the foregoing proofs will be convincing evidence to those who have been in doubt as to the misstatements of articles published and issued from time to time. If the readers of the *Annual* cannot accept the veracity and the proofs as herewith given, they only need to employ the foregoing analysis of the methods of exposures to convince themselves and obtain their own proofs.

The camera employed for this investigation was procured from the Conley Camera Co. It was fitted with their shutter and a F8 rapid rectilinear lens working at 12½ inches. The negative was made on Eastman Commercial Orthonon Film.



Correct exposure.

Illustrating article "Shutters and Their Speeds," by J. A. Ernest Zimmermann.

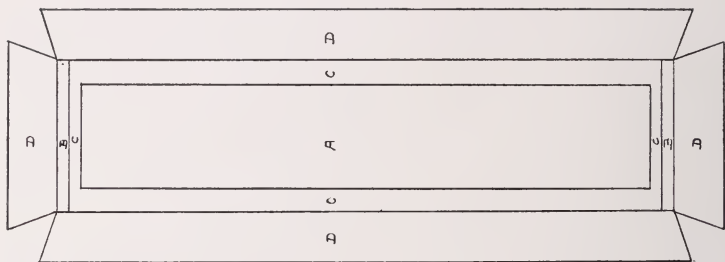


Figure 1.

Illustrating article "One Way of Developing Roll Film," by H. V. Schieren.

ONE WAY OF DEVELOPING ROLL FILM

By H. V. SCHIEREN



OME of us still cling to the "watch it as you go" method of development, and if there is anything more pesky and messy to handle in this way, than the average roll film, the writer has yet to find it. Casting about for some means of managing these long, unruly strips of wet celluloid, the use of a shallow tray with a glass bottom suggested itself.

After a little experimenting such a tray was evolved and it has proved a great boon, taking care of a long roll of film, and making development as easy as with a glass plate. My tray is made to fit the $4\frac{1}{4} \times 3\frac{1}{4}$ Graflex Roll Holder film, but trays can be made to take any size film, and no set rule can be given as to how big the tray should be, as it all depends on the size of the film you use. Make the tray just large enough so that the film fits snugly in it.

Lay off on a piece of fairly heavy and stiff cardboard, a diagram like Figure 1. With a sharp knife cut out the long strip down the center marked A in the diagram. This will be the slit through which you will watch the progress of development. Procure two small strips of thin wood (cigar box-wood) and cement one at each end with water-proof cement, B-B in the diagram. These strips are put in so that the ends of the film may be pinned to them with glass headed pins during development.



MORNING.

ARTHUR J. STOCKTON.

Cut a piece of glass the exact size of the bottom of the tray so that it will make a tight fit against the edges of the wood strips. Cement the glass to the cardboard all along the edge at C-C-C-C, in the diagram, and let the whole thing dry under pressure for several hours. When dry cut out the diagram on the outer lines, score the bottom with a sharp knife, and bend up the sides, D-D-D-D, to form the sides of the tray. Bind the corners inside and out with Dennison's heavy muslin glued tape, and bind all edges with the tape. Run a strip of tape along the bottom of the tray so that it projects over the glass a little, and can be seen from the inside through the glass. This will insure a water-tight joint. Let the tray dry thoroughly for at least twelve hours, and then give it a couple of coats of acid proof paint, being sure to let each coat dry well before applying the next.

To use the tray the film is first soaked in cold water until limp. Have the inside of the tray thoroughly wet and lay the film face up, pinning the ends to the wooden strips, at each end, pour on the developer and develop in the usual way.

When it is desired to see how development is progressing, pour the developer into a graduate and hold the tray up to the dark-room light, and the image can be plainly seen through the glass bottom. If a red light can be arranged on a low shelf or table, the image can be easily viewed.

After development the film may be washed in the tray and the hypo bath poured in, or these operations may be carried on in another receptacle. The glass bottom stiffens the tray and makes it quite strong so that it will stand hard usage. Made of cardboard the trays are light and can be easily handled, the writer having developed over three dozen rolls of film in one of them with no signs of wear.

Figure 2 shows the finished tray.



Figure 2.

Illustrating article "One Way of Developing Roll Film," by H. V. Schieren.



THE LIGHT OF THE CROSS.

LOUIS A. GOETZ.

Illustrating article "Laws of Art Versus Individual Taste," by Sigismund Bhumann.

LAWS OF ART VERSUS INDIVIDUAL TASTE

By SIGISMUND BLUMANN

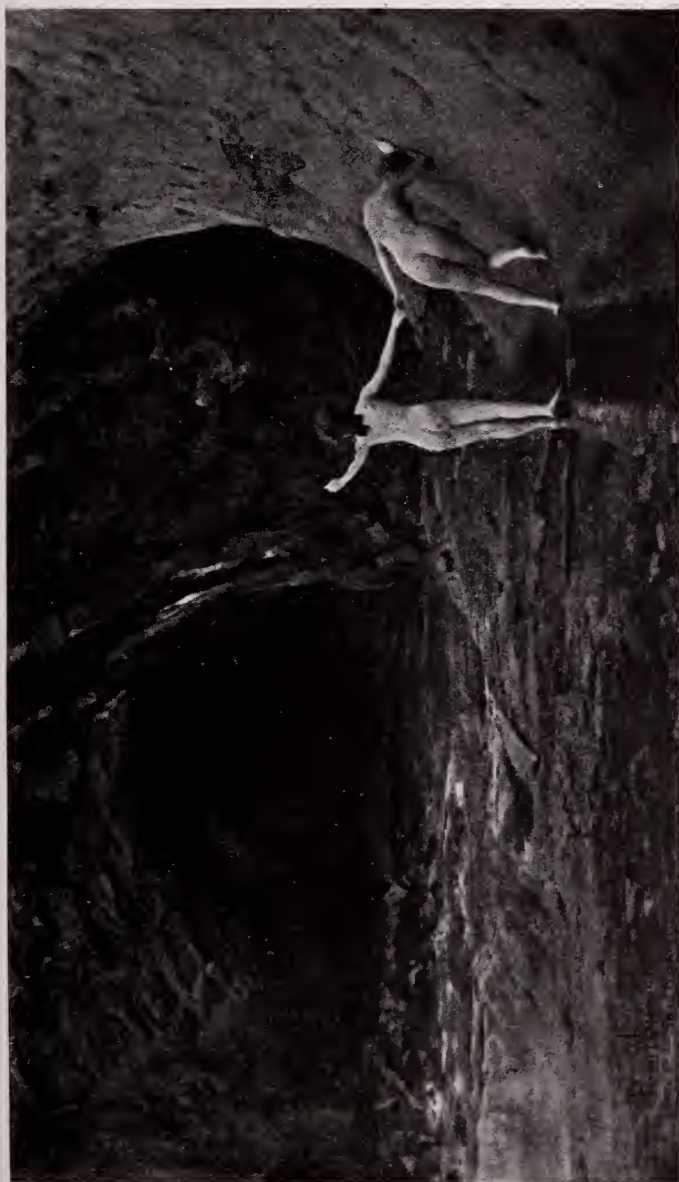


PEAKING of music, the lover of Jazz has been heard too often saying, "I don't know anything about music but I know what I like". With all due respect to the otherwise nobler animal who speaks thus, let it be considered that the hog knows nothing of fine eating but he, too, knows what he likes and it is swill. Individual taste is frequently confounded with originality. There is no connection. A hundred individuals are more likely to enjoy what is inferior to one whose trained senses and judgment qualify him to prefer the good.

Adages and epigrams have been made in good faith which seem to serve whatever purpose. The devil has quoted scripture, "Rules are made for the common mind: Great minds are above them". Are they indeed! "Genius knows no laws". Fly not like the eagle, little mind, or you may be shot for a goose. Fads are the ephemeral attempts to escape rules and they last for a day. But the arts of Greece have given Rodin his schooling. Praxiteles is still the master.

The rules of Art are not made arbitrarily and intended to curb individuality. They are arrived at by experience, and mature, patient study and consideration. They are based on laws of nature: Basic and fundamental. Hogarth's line of beauty is not a formula but a psychological phenomenon. Curves please because men have been created with a sense of ease and enjoy the smooth traverse of round lines and resent the violence of angles. Balance (not mathematical symmetry) is a quality within us not established by the will of man.

So in photography it behooves us to study well every law of Art, to master every application thereof, to adapt each to our form of expression, and if God has been so good as to make us great enough, to add to these laws with demonstrations of our own.



HO! CHARON!

Illustrating article "*Laws of Art Versus Individual Taste*," by Sigmund Blumann.

PERCY NEYMANN-

Unlike religion, which hath many creeds, Art has but one,
"To hold the mirror up to Nature", and while

"To him who in the love of Nature
Holds communion with her visible forms
She speaks a various language,"

we must never forget that it is Nature which speaks and not our own exalted self that makes the thunder roar, or the streams purl, or the breezes whisper.

The human form divine is divine when it conveys to us the beauty Divinity put upon it. When it is merely a naked body it is only carnal, ugly, obscene and calling it a Study in the Nude cannot make it an exemplar of Art.

When distorted trees and curdled skies manufactured by reticulated films and cotton batting are smudged on paper, we may say a new Art has arrived but there is no new Art. Though the bodies of men change and earth itself passes through its mutations, the primal force, the unit of origin, the first creative edict that started the universe shall be as it was at the beginning. And we who worship Art and love her, not as a pose or an affectation, but deeply and reverently, shall find we are doing something very near to worshipping the Supreme Power that made all things according to law.



RUSTIC BRIDGE.

E. F. WEBER.



THE ATHLETE.

LOUIS A. GOETZ.

Illustrating article "Laws of Art Versus Individual Taste," by Sigismund Blumann.

OUTDOOR PORTRAITURE

BY PAUL L. ANDERSON



ABOUT eighty years ago, D. O. Hill, a Scotch painter, became interested in photography, and worked more or less in that medium for several years. He does not seem to have left a high reputation as a painter, his work being, apparently, pretty rather than powerful, but had he given his attention to portraiture instead of, chiefly, to landscape, it is at least possible that he would have taken high rank among painters, for his photographic portraits show him to have owned a fine sense of composition and values, and a keen appreciation of character. Indeed, it is safe to say that the camera portraits made by Hill have never yet been surpassed by any photographer, and have rarely been equalled, a fact which is all the more surprising when we consider the difficulties against which he had to struggle.

Photography was then in its infancy. Lenses were uncorrected, and slow; the sensitive substance used for negative making was paper, crudely sensitized, and requiring long exposures; and the printing mediums available were so crude that it is only with the development of such processes as photogravure and gum-platinum that the full merit of Hill's work has been appreciated. In consequence of the primitive character of Hill's materials, his exposures ranged in the neighborhood of four or five minutes, and to secure full exposure even with this long time he was obliged to pose his sitters out of doors, generally in a full blaze of direct sunlight.

With the development of faster lenses and more rapid plates photography, so far as portrait work is concerned, became an indoor sport, and when some unthinking copy-cat built him a studio with a north sky-light the path first traveled by Hill deteriorated into a little-used trail; gradually the conviction grew among photographers that the place to do portrait work was in a studio, and it was many years before the daring amateur rushed in where more experienced workers feared to



OUTDOOR PORTRAIT.

PAUL L. ANDERSON.

tread, and proved that equally good—and often better—portraits could be produced in home surroundings. Even yet there is a feeling against doing portrait work outdoors, and the writer has heard a well-known photographer declare flatly that it was impossible to produce satisfactory portraits in an outdoor light.

It is by no means impossible to do so; Hill proved this conclusively, and a few more recent workers have added to his original demonstration, but it remains somewhat more difficult. It is, however, unquestionably the case that in many instances outdoor portraiture shows a quality which is utterly unobtainable indoors, and is therefore more satisfying. The writer does not mean to claim that all portrait work should be done outdoors; the home and the studio both furnish satisfactory settings, and magnificent work has been done in both places, but he does mean to say that it is a mistake for camera workers to confine themselves within four walls and under a roof when making portraits.

When working outdoors the photographer finds certain advantages and certain disadvantages as compared to indoor practice. The disadvantages may be enumerated briefly, the most conspicuous one being the fact that the background and surroundings vary; the uniformity which exists in the studio, permitting the photographer to concentrate his attention on the sitter, is lost, and a more alert mind is required to correlate the sitter with the surroundings. Also, the background is often beyond control, and can be varied only by moving to another spot. The light is also beyond control, so that the worker must modify his ideas and his attitude to meet the illumination, instead of changing the light to suit his ideas. And the clothing suitable for outdoors is not always that appropriate to either home or studio, so that a certain expression of the sitter may be impossible.

But as so often happens in photography, disadvantages bear somewhat of the flavor of advantages; the good and the bad are so inextricably mingled that we cannot say definitely, "such-and-such a thing is undesirable." The very conditions which require an alert and open mind develop thereby a sensitiveness, an appreciation, which would otherwise be lacking, and result in a freshness and spontaneity that is rarely seen in



OUTDOOR PORTRAIT.

PAUL L. ANDERSON.

studio work, the variety of surroundings contributing in no small measure to this effect. That is, the changing conditions help in two ways: directly in the setting; and indirectly, in the photographer's mental attitude. The quality of the light also may help, for an outdoor light, especially if direct sunlight, gives a snap and life which cannot be secured indoors except at the expense of naturalness; the use of spotlights and secondary lighting will give it, to be sure, but it then becomes difficult to preserve unity and harmony, and the effect is not that of a figure bathed in sunlight. So, too, with the clothing. Furs are more convincing when seen against a background of snow and sky than when worn indoors; a riding habit is more at home outdoors than in the studio; and a light summer garment harmonizes better with a background of trees than with the painted background of the studio.

So we find that in enumerating the disadvantages we have also named most of the advantages, but one remains, and that no inconsiderable one, especially when working with children. The greater strength of the outdoor light permits of conspicuously shorter exposures than are possible indoors, with the result that children may be photographed at play, in action, thus securing a natural effect which far surpasses even the best of studio work. Stronger light is an advantage, too, with adults, since the use of color-sensitive plates in conjunction with a ray-filter becomes a possibility, and a convincing quality of roundness, together with perfect texture rendering, results, this being not easily attained in the studio, and even when it is so attained, it is generally at the expense of other qualities.

Now as to working methods. The very flexibility of outdoor work precludes any positive instructions; there are no rules in art. Each worker must determine for himself just what he will do, selecting clothing, arrangement, pose, lighting, to express what he wishes to say; the alert mind must be, precisely, alert, and it is not so easy to fall into a rut as in studio work. But a few suggestions may at all events be given.

It is not, in general, well to have the sitter facing directly toward the sun, or even at such an angle that direct rays fall on the eyes, for in such circumstances most persons will squint. The writer has, however, seen a portrait by Coburn



THE STORM KING.

CHARLES L. SNYDER.

in which the sitter was turned almost squarely toward the sun—but her eyes were shaded by a broad-brimmed hat. The contrast between the fully illuminated lower face and the shaded forehead was very striking, and the portrait was eminently successful; of course, full exposure and soft development were required to retain the values. Still, it is generally better to have the sitter turned so that the direct light comes slightly from behind, the general illumination being reflected from the sky or from some nearby object; the effect of relief obtained by means of the resulting halo on the figure is noteworthy—and natural. As in studio work, a secondary or reflected light should explain itself; few things are more irritating than the double light so popular among the motion picture workers, where aluminum screens are used to throw light into shadows, the effect being usually overdone. The writer has seen a motion picture in which this had been carried to such an extreme that in an outdoor scene, in full sunlight, the catchlights in the eyes came from below. The careful and sincere worker, however, need hardly be warned against such absurdities.

As for settings, any place will do. A porch, a brook, an orchard, a pergola, the side of a house, the open sky; all these have been used, and well used, for backgrounds. It is simply a matter of keeping one's eyes open and selecting a setting which will harmonize with the thought one wishes to express, and it cannot be too strongly emphasized that no place should be rejected because of preconceived ideas; each should receive consideration, not on its character, but strictly on its merits as an arrangement in black and white. It is, of course, necessary that the surroundings shall not compete in interest with the sitter, but this is equally true of indoor work. Still, the caution may perhaps not be out of place, since there is greater danger of such an occurrence outdoors than in, the ordinary surroundings being more varied. Whether the background is foliage, flowers, or any other varied subject, the definition should be such as to prevent its deteriorating into a collection of meaningless blobs of light, and this brings us to another matter of importance, the lens.

A soft-focus lens is desirable in all portrait work; sharp definition, however valuable in scientific photography, is dis-



THE FONT.

L. D. Sweet.

tinctly out of place in portraiture. The writer does not mean to advocate the extreme blurriness seen in some pseudo-artistic portrait and genre photographs, but the definition of an anastigmat does not correspond to that of the eye. A famous scientist once remarked that if an optician should give him so poor an instrument as the human eye, he would reject it scornfully. This is true enough, so far as it goes; the normal eye is subject to all the errors of an uncorrected lens with the exception of astigmatism, and many eyes own that fault as well. It is true that the eye possesses certain advantages over any lens, such as automatic focusing, automatic diaphragming, and the power of rotation, which makes it, in effect, an extreme wide-angle instrument, but the fact remains that it does not give precise definition, and an objective which does this cannot correctly represent the subject as the eye sees it. Therefore, a certain amount of softness of definition is desirable, and, in general, the softness may be slightly exaggerated above that given by the eye, not only without offense, but even with positive pleasure; sharp outlines are offensive to the cultivated observer. A further advantage of the soft-focus lens is that the subject may be harmonized with the background in a more satisfactory manner; the fact that neither one is sharply drawn tends to bring the two into better relation, making the subject seem appropriately placed in the surroundings. Still further, a soft-focus lens does not incline so much as a corrected one to give the distressing blobs of light referred to. And if the work be done in full sunlight, a good soft-focus lens, properly used, renders the shimmering, vibrating quality of the light as no corrected lens can ever do.

As regards the camera, the best one is that to which the worker is accustomed, though for the portraiture of children a reflecting instrument of the Graflex type is very desirable. Negatives made with such a camera will probably require enlarging, but this is no disadvantage, and the advantages are great. In fact, the writer does practically all of his portrait work, both indoors and out, with an instrument of this kind.

Plates should, in general, be used, as they are more generally satisfactory than films, possessing a finer quality, and those of the non-halation type are almost imperative; otherwise, the quality of foliage against the sky, of distant, illumi-

nated landscape, and even of the figure itself, will suffer. And in most cases color-sensitiveness is to be desired, for the ordinary plate has a tendency to flatten the subject. This may be desirable when a poster effect is sought, but for most portraiture full rendering of color values is preferable. The writer's choice of plates falls on a backed or a double-coated panchromatic, but a double-coated orthochromatic will do admirable work; in fact, many of the writer's best negatives were made on the latter type of plate. It should be borne in mind that a color-sensitive plate, used without a ray-filter, possesses hardly any appreciable advantage over an ordinary one, and that if the filter is not correctly adjusted to the plate the result may be even worse, so far as color rendering is concerned, than if no filter were used.

Most outdoor portraits will be printed in a relatively high key. The general effect of outdoors is luminous, and to print in the full scale or in a low key is to destroy this effect. To be sure, a low key will at times be used, but in the main the case is as stated. Further, except for special effects, usually in an extremely high key, a warm print on a cream tinted stock will give the best result; sometimes a very delicate light gray will be best, but not as a rule. Consequently, the printing medium should be one which best renders this effect, and for straight prints there is none which equals platinum. The lustre of carbon fits it better for strong indoor effects, with large masses of dark; it is difficult to secure clear, pure highlights in gum; and most bromide and gas-light papers utterly lack the charming surface texture of platinum. Next to platinum comes a good matt-surface bromide—and there is no third. If, however, the worker wishes to be able to modify results at will, emphasizing a light here, lowering a shadow there, and, in short producing a work of art rather than a mere mechanical representation of the subject, no other process can compare with oil or bromoil. The oil-pigment processes are the most flexible of any yet devised for photographic use; color, values, even line itself, may be varied at will, and the surface texture of the print may vary from the precise, dry texture of gas-light, to the loose texture of a gum print on rough paper. We may have the dull surface of platinum or the lustre of carbon; we may even vary the texture in different portions

of the print. Briefly, there is no other process which offers so many advantages as oil, the sole drawback being the comparative slowness of production. But if one lion is better than a hundred jackals, we may fairly say that one fine print is better than a hundred mediocre ones, and we will choose oil for the rendering of our negatives.

So the photographer, whether amateur or professional, who takes up outdoor portraiture for the first time will find himself led to a most delightful experience, provided he will remember two things. First, not every subject can be rendered outdoors; and, second, he must approach literally every subject with an open mind, free from preconceived ideas. Given these two facts, and the technical skill to handle his instruments, there is every reason for him to expect a higher percentage of pleasing results than if working in either the home or the studio.



OUTDOOR PORTRAIT.

PAUL L. ANDERSON.

NIGHT PHOTOGRAPHY

By SOPHIE L. LAUFFER

 HE amateur photographer is apt to think of night photography of street scenes, buildings, etc. as too difficult for him to attempt. He is depriving himself of one of the most interesting phases of pictorial photography. True, the amateur must have unending patience, endurance, and especially good nature. People *will* stop, look, smile knowingly, pass on; Street urchins *will* be pests standing in front of the lens, getting into the picture. All you have to do is pretend that you are making an exposure and they will pass on leaving the field to you. You will invariably come across the young man who knows it all and will insist upon giving advice. Take it, thank him, and he will pass on self satisfied with "all the good he has done."

You will find it very beneficial and time saving in the end if you spend two or three evenings walking around looking for pictures that will lend themselves to night rendering. Wandering around aimlessly with the heavy apparatus needed is more than discouraging. Having chosen some half dozen or so likely subjects, you start out another evening with the proper equipment.

A view camera is absolutely essential as seldom does one take a scene which does not contain a building or other structure, and what is worse than faulty architecture? A little precaution at the beginning will encourage one to do more of this kind of work. A good substantial tripod is needed. Wind, storm, rumbling vehicles all are to be thought of. A large rubber focusing cloth will be helpful for focusing and in case of storm. As for films or plates, I have found portrait films have given me the best results, especially when the black paper that comes between them is placed in the holder.

Much has been said about the lens, and I hope that I will not shock the reader when he hears that I have always used



AN ANCIENT LANDMARK.
Gum Palladium.

SOPHIE L. LAUFFER.

a soft focus lens of two elements. The rear element used alone and stopped down to F/6 or F/8 has given the best results. The barrel acts as an excellent hood. At night one does not see every detail, then why not use a lens of the soft focus type?

Relative to exposure, take an evening before starting on your real expedition, go a short distance from home and make three or four exposures of the same scene, varying the time from one-half minute to fifteen minutes. Experience is the best and only teacher.

Select that point of view which will have the lights evenly distributed. Glaring lights should be avoided. A cap is to be preferred when making the exposure. Each time a lighted vehicle passes, cap the lens, otherwise streaks are produced across the plate.

When developing, aim for the softness, the mellowness of night. A developer of the Azol or Rodinal type has proven most successful for this. If there be much halation this can be remedied if the negative, while still wet, is rubbed lightly with a piece of absorbent cotton saturated with alcohol. A paper that will give a good warm black renders night effects best. A gum print, using a little brown pigment with the black, gives excellent results. Palladium (warm black) with a thin coating of gum gives the soft mellowness of night better than anything else I know of.



A CANAAN EVENING.
Kallitype.

SOPHIE L. LAUFFER.

LANTERN SLIDE PAINTING

By MARCUS G. LOVELACE, Mus. Doc.

ANTERN slides to my mind are one of the most beautiful forms of the photographic image, and when properly colored are even superior to the plain slide. I have heard many people express preference for the hand colored slide to the Autochrome or Paget, although the writer cannot agree with them on this point, for to my mind there is no form of photograph that will compare with a good color plate.

Many miles of direction have been written about the coloring of lantern slides, but with one exception I have never seen any that were really practical. Most people use water colors. While it is possible to use them so that they do not look like the terrible things we see in the theatres announcing "The Perils of Pekin in 5 reels, with George Manleigh, and Lovine Sweet," it is not often that they are anything but a warning to young slide painters.

Nothing is more pleasing to the beginner than to get his color eight shades too dark, using some of the various aniline colors and then try to get the color out. It can be done,—sometimes. Usually your slide is spoiled. With the use of oil colors all these troubles are avoided, and there is really only one difficulty to contend with—what this is I will explain at length.

For materials, I am going to give specific names, as I have found that all brands of paint do not work the same, and some will not work at all. Get enough colors—life is too short to spend time mixing shades all the time. The outfit that I am giving here will only cost three or four dollars at the most, and will paint upward of a million slides—easily.

The colors I use are—"Windsor & Newton Transparent Oil Colours"—a special color made for transparent work. Get the following colors—Gamboge, Chinese Orange, Mars Yellow, Alizarin Crimson, Crimson Lake, New Blue, Prussian Blue, Brown Pink, Italian Pink, Burnt Sienna, Vandyke Brown.



THE REAPER.

Eugene P. Henry.

For medium to mix them with I must acknowledge my indebtedness to Mr. Alfred H. Saunders, for a formula given in the *Annual* some years ago and which I reprint here. It is the best medium I know, and I have tried them all, or nearly all.

Transparent Gold Size, 4 parts.

Pure Linseed Oil, 2 parts,

And pure Turpentine, 1 part.

Get these from a dealer in Artists' materials, or you will not get linseed oil or turpentine, but some villainous compound which will ruin your work. Mix these well and you are ready.

Dust is the prime enemy of the slide painter—guard against it as a plague by whatever means is necessary. Do not paint by daylight—use a light of the same color as the one by which it will be shown, or as near as possible. A nitrogen filled bulb—a white one—is first rate—then use a piece of opal glass, not ground but opal for an easel. Put it at an angle of about 45 degrees and your easel is ready. For a palette nothing is better than another piece of glass, not opal but clear, prepared as follows. Arrange your colors in a row, all reds together, all blues together, etc., then take a brush and put a small dab of each color (mixed with a little of the medium given above) on the top edge of the glass. After they are all on make a list and paste it on the back of your palette, so that it can be read from the front. By merely looking at the row of colors on the top edge of your palette, you will know what color you want to put out, and use. This may seem a small item, but after painting slides awhile it will be found very valuable as a time saver.

Brushes are a big item. If they are good you will have little trouble in doing good work, but if they are poor, they are an endless nuisance, as a hair from a brush ruins a slide if left on and usually you will spoil the slide if you try to remove the hair.

The brushes used are called flat top, camel's hair, china painters shaders, round, in quills. That is the full name and Devoe and Reynolds make an excellent grade. Get some handles for them when ordering. You will need about four—ranging from an eighth to a little more than a quarter of an

inch in diameter. They are round stubby brushes like a short cylinder of hair, but when filled with color they will fan out until they will draw a line as fine as a hair. *Do not try* to use the ordinary pointed water color brush if you want success.

The most difficult thing to learn in slide painting is the operation called *fingering*. It is not possible to put large tints on a slide by means of a brush. Streaks will show in spite of all that can be done to prevent them. Large tints are put on in this way. A small amount of color is put on the palette and mixed with a little medium. It is then painted on the slide and then fingered. This is done by polishing the second finger of the right hand with a piece of pumice stone, under water, until the finger is smooth as glass, taking care not to rub until finger is raw. Dry the finger and then finger as follows. Start at the bottom of the tint to be fingered and dab with the ball of the finger that has been polished. Roll the finger as you do so, so that each dab is a short roll of the finger on the smooth part. Do not dab without rolling the finger, it's a waste of time. Do not drag the finger, the paint will smear. Dab lightly, do not press heavily. Roll the hand from the thumb side *toward* the little finger. Each dab must overlap the last one made, and the pressure must be even.

Much depends on the consistency of the paint. If the mixture of paint and medium is too thin—that is, there is too much medium—the mixture will remain in little mottled puddles after each finger dab. If the mixture is too stiff or too dry, you will have prints of the finger at each dab. When the paint and medium is working right, and is just dry enough, each dab will leave a little mark which will run together and as *fingering* goes on will gradually form an even tint. Note the two conditions—1st: If paint and medium mixture is too thin, it will leave little puddles of paint after it, like foot prints on a wet floor. 2nd: If mixture is too thick, it will stick to finger and leave imprints of the finger on the slide.

This may seem a little unnecessary attention to detail, but *fingering* a slide is one of the most important things, if not the *most* important of the whole process—without it it is hardly possible to paint any kind of a slide whatsoever.

If you do not succeed at first—and it's almost certain you



IN BOSTON HARBOR.

PETER J. SCHWEICKART.

won't—have some benzole handy, wash the slide off and you are ready to try it again.

Now for a slide—get a seascape if possible, it's easiest, and proceed as follows. Take a small quantity of Prussian Blue on the palette and mix with a little medium. Take your slide and paint it all over with this color. Lay your brush down and start to finger the color even, watching for the faults I have just told you of. You may have to wash the slide off four or five times, but it will not be hurt if you are careful. Read the directions on fingering again. Finger from left to right along the bottom edge, wipe the finger clean, and start to finger the next section higher, being sure that the upper rows of dabs always overlap the one below it, and wiping finger clean at end of a row of dabs. You must learn to finger an even tint before you can do anything else, so have patience and after a little without any change in your method of working, you will find that you can put on a tint as smooth as can be. Remember what was said about the paint being too thin or too dry, keep trying, and soon it will be easy.

Suppose that you have had good luck the first time, and you have an even blue shade all over the slide. If it is too light you should have used a darker color to start with—if it is too dark the original color should have been lighter. If it is too dark, keep on fingering and wiping. If it is too light dab on some more color and finger again. When the color is the right shade take a chamois stump (from a dealer in artists' materials) and wipe out all the places where you do *not* want blue—for instance, in a seascape—wipe out your beach, flecks of foam, boats, etc., leaving the blue over the sky and sea. Do *not* use cloth or anything but chamois, or you will have lint on the slide which ruins it. Wipe the stump clean with benzole and a rag, and it will last a long time. Remember if you spoil the slide in wiping out blue where it is not wanted, wash the whole slide with benzole and paint it again. Should you run over the edge, say, of a sail or a whitecap, and take some of the sky away, it can be fingered with a little care and blended so that it will not be necessary to paint the whole slide over.

After the blue is put on, and all detail where you will use other colors is wiped clean, put the slide into a tin box, say

about 8 x 10 by 2—made without solder, and with a tight fitting lid. This is called the stove, and is for drying the paint hard. The slide must be heated to about 200° for several hours in order to bake the paint dry and hard, which must be done between each painting. 200 to 250 Fahrenheit for about three hours is enough—too *much* heat will cause paint to turn brown.

When slides are cool, go ahead and paint in your detail, as much as possible, taking care that wherever one color goes over another the first one is baked before the other is put on. After you have painted your first slide, put it in the lantern and learn your mistakes. It will probably be too dense, too dark, have dust on it, hairs from the brush, etc., so do not be discouraged, just make it over again.

Many people like to blend a sky from a deep blue at the top to a fine red at the bottom—why, I don't know but it is done and this is the way it is done with oil colors. Start at the horizon with a sweep of Crimson lake, above that a strip of Prussian blue or New Blue then above that a sweep of Vandyke brown.

Now start at the bottom and finger, blending them together and the trick is done. Another combination of this sort is Italian pink, then Prussian blue, then Vandyke brown above that.

In painting waves, water, etc., coat entirely with blue, fingered on, and then put on light touches or coats of yellow and brown in order to make the green shades wanted. Grass is better made this way than by mixing colors. I would advise the slide painter to buy a few oil colored slides such as the "Raft of the Medusa by Gericault," and it will teach you more of what a well fingered sky and sea should look like than pages of description could ever do. In putting in clouds they should be wiped clean of paint in this way. Take a small piece of chamois skin, and roll up into a small cylinder—wipe out the clouds with a circular motion and then finger smooth so that the sky blends into the clouds in order to avoid the "Hole in the sky" effect that is all too common.

I am not going to attempt to tell you what colors to mix to make definite shades as the *Annual* is too limited in size to let me have fifty or sixty pages. The object of the glass palette

with the sample colors on the top is to enable you to see what the colors look like when light shines through them, and with a little practice one can get shades that will fit any picture. An artist friend tells me that with the colors I have mentioned in the list a man could paint any picture that has ever been painted, so there you are.

Another word and I am done—oil colors are as permanent as can be made. Any water colors suitable for slides will (in time) bleach out when used in a powerful lantern. Why spend time to make them if they will bleach out in a short time? I am sure that anyone seeing a good oil slide will never use any more water colors, and I can assure you that if you will practice the above given directions faithfully, you cannot help but succeed. I dislike giving rules exceedingly, but possibly these brief rules will help the young painter.

1st—Put in your largest tint or your blue first—that which must be fingered and then bake dry.

2nd—Put in your reds next, and your yellows last, baking after each one.

3rd—You can paint all over a slide with all sorts of colors, without baking in between each application, if they do not touch each other. Small detail in various parts of a slide, such as a large group, can be painted all at the same painting, if you don't let separate colors touch each other.

4th—Never try to paint over a color until it has been baked dry. It cannot be done.

5th—You will save time by following these directions exactly and by trying the slides in the lantern until you get a good idea of how dense they ought to be—it is impossible to judge by the eye until you have had considerable experience.

6th—Much time is saved by painting several slides at once—putting in all that is possible on each and then baking them all at once. Painting single slides, except at first is a terrible time-killer. It takes no longer to paint a dozen slides with oils than with water colors, except that all of one color is put in at once with oils, and with water colors you paint the slide with all the colors at once.



BRONX RIVER, N. Y.

WM. C. SETTGAS

THE OPTICS AND MECHANICS OF ENLARGING

By A. LOCKETT



THE essential factors for securing a truthful enlarged reproduction of any photograph, as far as the formation of the image is concerned, are: (1) Uniform lighting; (2) the suitability of the enlarging lens, or objective; (3) the correct fixing and adjustment of the objective; and (4) the perfect parallelism of negative and bromide paper. The first two are optical factors, the third is partly optical and partly mechanical, while the fourth is wholly mechanical. These points are most conveniently dealt with in turn, though in many respects interdependent.

Firstly, with regard to uniform lighting. If using a daylight box-form enlarger, care must be taken to point it at a clear sky. Clouds may cause unevenness should the negative be thin, in which case it is advisable to hold a piece of ground-glass a few inches above the enlarger. If employing an adjustable enlarging camera, one should see that the outside inclined white reflector is quite clean and receives an unobstructed light. Sometimes part of the reflector is shadowed by its nearness to the building, or by a projection overhead. A point often overlooked is that the reflector should be large enough to fill the whole view-angle of the lens when the camera is at the shortest extension likely to be wanted. Thus, in Figure 1, the dotted lines give the angle included by the lens A, at a given short distance from the negative B. They demonstrate how, at that extension, the reflector C is too small and will not light the whole negative evenly, although it will do so when the camera is racked out further, for a smaller-size enlargement. This will be especially apparent with a thin negative, or when making an enlarged negative from a transparency. For the same reason it is important to see that the opening in the window shutter D is sufficiently large, according to its distance from the negative.



PECONIC BAY.

Wm. Elbert Macnaughton.

When the window faces the sky, or has an open expanse in front, it is often better to cover the aperture with fine ground-glass or tracing paper, omitting the reflector. The negative should not be too close to the diffusing medium, or the grain may be focused.

With an enlarging lantern having a compound plano-convex condenser it is a much more complicated matter to get even lighting. The brightest part of the arc, incandescent filament, mantle, or lamp flame, as the case may be, has to be brought on to the common axis of the condenser and

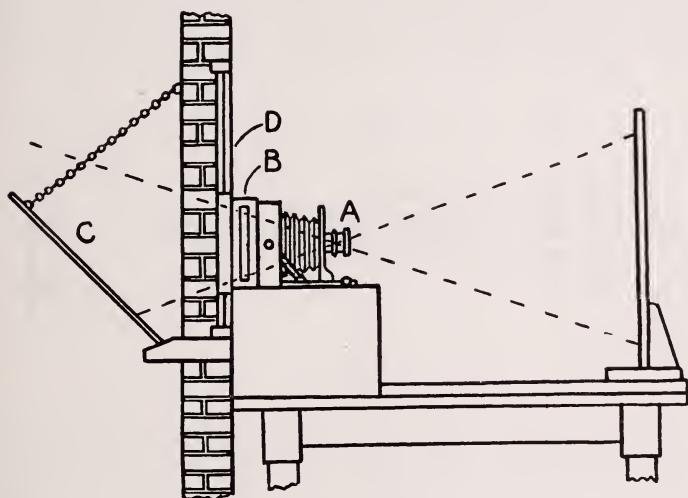


Figure 1.

objective, and adjusted at just the right distance from the condenser, which varies with the amount of enlargement. Theoretically, the conditions are as illustrated by Figure 2, where it will be seen that the illuminant A is placed at such a distance from the condenser BC as to converge the beam of light into the center of the objective D; while, at the same time, the objective itself is in such a position with respect to the negative E as to project a sharply-focused image of the desired size on to the easel F.

Ignoring, for simplicity, the exact nodal points, this means that the distances AB and CD are conjugate foci of the

condenser, while the distances ED and DF are conjugate foci of the objective. In practice, however, such an adjustment has to be deviated from, owing largely to the condenser being poorly corrected and having no precise focus. The best lighting is found to be obtained when, the negative having been removed, an image of the light-source is formed on a white card temporarily held a little way in front of the objective.

Since the position of the illuminant has to be altered for every variation in the scale, or ratio, of the enlargement, one should first roughly focus the latter to the desired size on the easel, without paying much attention to the lighting. The negative should then be withdrawn, and the lamp alone

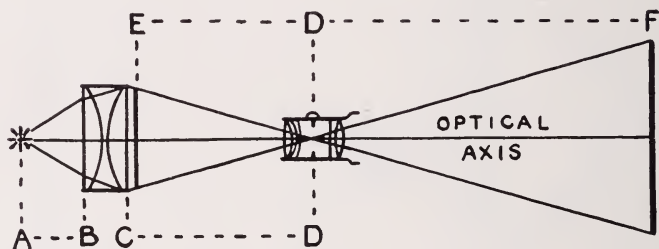


Figure 2.

moved, adjusting its distance and centrality till the easel is brightly and evenly lit. Lastly, the negative is re-inserted and sharply focused, noting that this does not again render the lighting uneven, and, if it does, once more very slightly shifting the lamp.

An up-to-date cinematograph operator, by the way, would refuse to employ a compound plano-convex condenser, owing to the large amount of spherical aberration. Photographers might find it worth while trying whether the Herschel, or meniscus and bi-convex pattern, would not be as superior for enlarging as it is acknowledged to be for motion-picture purposes.

In the writer's opinion, however, uniform artificial lighting is more readily obtained by using a silvered reflector, either spherical, parabolic, or of the parallax kind, and doing away with the condenser altogether. The lamp A (Figure 3)

should be in the focus of the reflector B, so as to throw the light in an approximately parallel beam on to a piece of flashed opal C, placed about an inch behind the negative D. This method is especially suitable with nitrogen-filled bulbs. It is also very convenient for using objectives of different foci, as may sometimes be wished, which cannot be done with the ordinary condenser unless the negative stage is movable.

Another excellent system of artificial illumination, applicable to one's own camera or to any daylight enlarger, is to employ a dull white surface as a reflector, either flat or bent to an ellipsoid or paraboloid curve. Burners or electric lamps are arranged at each side so that their combined diffused light is reflected to the negative, whereas direct light is

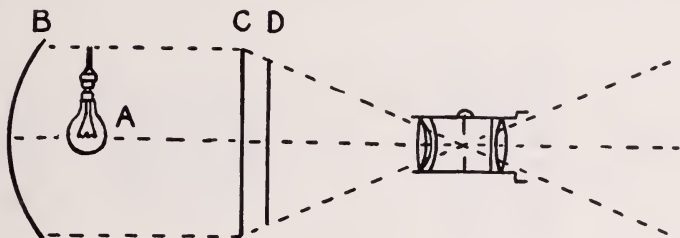


Figure 3.

screened off. This is an extremely efficient method, and shares with reflected or diffused daylight the great merit of not showing up retouching or scratches, so familiar a drawback when enlarging with a condenser and an unscreened light.

We now come to consider the nature and quality of the objective. The selection depends somewhat on the kind of lighting. With daylight, the aperture is not important, save that a small stop evidently prolongs the exposure, especially when the scale of enlargement is carried beyond a modest size. Enlarging lanterns, however, are generally fitted with portrait lenses of the Petzval type, having Waterhouse stops and focusing by a rack and pinion. Its large aperture apart, this kind of lens is by no means the best for the purpose. It suffers slightly from curvature of field, that is, the center and margins of the picture are not in equally sharp focus at the same time, with the largest diaphragm. Hence, a midway

position has to be selected, and a stop then inserted to give greater sharpness.

A point which often gives rise to confusion is exactly what happens when stopping-down the objective in enlarging. This will be better understood by remembering that the diaphragm has two distinct functions; firstly, to improve definition and increase depth of focus, and, secondly, to regulate the amount of light that passes, thereby adding to or reducing the exposure. Now, in daylight enlarging, or with artificial light when a diffuser or a white reflector is placed behind the negative, the stops act normally; that is, an aperture half the size or area of another will need approximately four times the exposure. When using a condenser alone, however, the conditions are no longer similar, but depend on

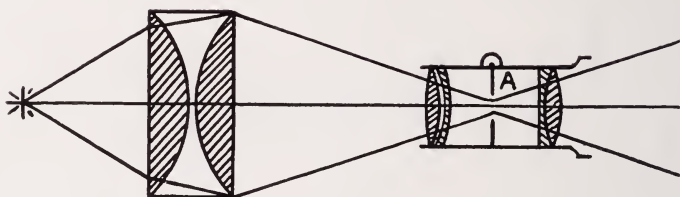


Figure 4.

the extent to which the beam of light is converged in the objective.

Thus, with a "point" light-source, such as an arc lamp, the beam is converged to a slender compass in the lens, so that the whole of it readily passes through a comparatively small stop, as seen at A, in Figure 4. It is, therefore, evident that there will be no difference, as regards exposure, between the small stop and a larger one, since the beam remains the same; the only difference, if any, will be in the definition. With a large light-source, however, such as an incandescent mantle, the beam will occupy greater space in the lens, and require a wider aperture for its unimpeded passage, as seen at B, in Figure 5. Hence, it is plain that stopping-down will cut off some of the light, besides probably giving uneven illumination. It will also be noted, in Figure 5, that the diameter of the objective is barely sufficient to admit the beam. A large light-

source, then, not only needs a rapid lens for the best results, but one of adequate diameter.

All things considered, a large-aperture anastigmat is far superior to the Petzval objective. Its field is perfectly flat, and the definition uniformly sharp from center to margin, even with the full opening. One of more moderate aperture will, of course, answer with a small light-source. Such lenses can be obtained to order in focusing mounts or jackets, and a metal iris diaphragm should be stipulated. Some lanterns have a fine-adjustment screw to the front, which renders unnecessary any provision for focusing on the lens.

With regard to the focal length, a short focus has the advantage that the distances from lens to easel need not be so great, also the depth of definition is superior should it be

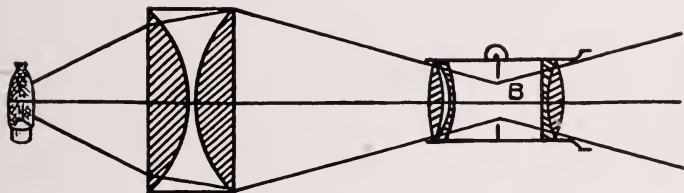


Figure 5.

required to tilt the negative and easel in curing distortion. If a portrait lens is being used, however, a somewhat longer focus is advantageous, since, owing to the narrow angle at which the beam of light enters, the central portion only of the lens is brought into service.

The focal length of the condenser and of the objective must, in any case, be mutually suitable. A handy rough rule to remember is that the best focus for the objective will be about equal to the diameter of the condenser, or within $\frac{1}{2}$ in. less or more than the diameter. Thus, a condenser $5\frac{1}{2}$ in. in diameter, as used with $3\frac{1}{4}$ in. by $4\frac{1}{4}$ in. negatives, needs an objective of from 5 in. to 6 in. focus.

Coming to the correct fixing and adjustment of the objective, it is important that the optical axis of the latter should be perpendicular to both the negative and bromide paper. In a fixed-focus box enlarger this is a practical certainty, and it

may also be expected in adjustable daylight enlarging cameras of sufficiently rigid make. Unfortunately, the same cannot always be asserted of enlarging lanterns, especially those of an old-fashioned pattern, or that have been much in use. Now and then one comes across an instance where the extension frame is weak or insufficiently supported, with the result that the weight of the objective is able to bend it appreciably downwards. Sometimes it is even found that the lens-board is not mounted at a true right-angle to the extension frame, or is warped, so as to give a distinct twist to one side.

Another essential occasionally lost sight of is that the axis of the condenser and objective should coincide. Many lanterns are now fitted with a rising and falling movement of the lens-board, and this may give trouble unless used with discretion.

We now arrive at the fourth factor, parallelism. To obtain an accurate and undistorted enlargement, it is ordinarily indispensable that the plane of the negative should be parallel with that of the easel, both being perpendicular with the axis of the objective. Many cases of uneven definition may be traced to some carelessness or structural fault in these respects. Thus, the carrier may have its rebate wrongly cut, so as not to be parallel with the outside surface, or it may be unprovided with spring clips, so that the negative is loose. A very trifling shift of the negative will have a considerable effect on the focus. A displacement of the easel is not injurious to the same extent, but even that may interfere with uniform sharpness. The easel may be untruly mounted or not properly level, especially if home-made, for, simple as it seems, to obtain (and retain) a really flat surface is not at all an easy matter. The performance of an altogether unexceptionable enlarger is often thrown quite out of true by a clumsily-constructed makeshift easel.

An exception to the foregoing rule of parallelism must, of course, be made when it is desired to correct the slanting upright lines of an architectural negative, due to its having been taken with the lens out of the horizontal, and with neglect to use the swing-back. In such circumstances, it is usually possible to get the lines right again by tilting the negative and the easel, many of the more expensive enlarging outfits



THEODORE EITEL.

being furnished with adjustments for this purpose. After any occasion of using these, great care should always be taken that the negative-holder and easel are again returned to the exact vertical—indeed, there ought properly to be some automatic device to check them in that position, or to show at a glance that they are in it.

Enlargements are frequently rendered uneven in sharpness from the mere fact of the paper not remaining flat when pinned up. A glass-fronted easel is, therefore, much the best. It should be seen that the glass is free from defects.

If the easel has grooves cut at the base to run on inverted-V rails, particular attention is needed that these grooves are truly perpendicular to the easel when the latter is upright, otherwise it will be given a sideways twist, a tilt forwards or backwards, or possibly both. Perhaps the fault may be so slight as to escape casual notice, and yet sufficient to affect the definition in part of the enlargement.

It is quite possible to shift the easel when fixing the paper, and it will not do to rely too much on a weighty base, though, obviously, this is desirable. The easel might with advantage be provided with some kind of clamping screw, to render shifting impossible.

In conclusion, the probability of vibration must not be overlooked, for a very little of that will go a long way to destroy sharpness. And vibration, it may usefully be remembered, is quite compatible with great apparent rigidity of construction. That is to say, a seemingly light and fragile apparatus may actually be firmer and steadier, owing to scientific design, than one much more solid-looking and heavily-built.



MRS. STANDIFORD-MEHLING.

IN OLD KINGSTON, N. Y.

By WILLIAM H. BROADWELL



HAVING previously been over this ground I decided a more extensive trip to obtain photographs of some of the many historical places would prove both interesting and profitable. Accordingly I loaded my car with photographic materials, plus a very simple camping outfit, and started off one morning for the Catskill mountains.

I followed the well-known Catskill highway to Kingston. Making my way in a leisurely manner I reached a point half way between Kingston and Saugerties where I found a nice secluded spot, pitching my tent and camping for the night. I did this so as to reach Saugerties in the early morning when the light would be most suitable to photograph an old house I had passed several times before, but always when the light was wrong. This time I was obliged to make the exposure during a rain—however the light was perfect. It is the oldest house along the Hudson river, remaining in the possession of the original family. It is over 200 years old, and the only one I know of which has the original smoke-house still standing.

Continuing on I made my way through Catskill and Jefferson. Each of these towns contain many old houses of great interest. On through East Windham to Gilboa; the latter a place of the past because this town is now uninhabited and will soon be under the waters of a large reservoir. Here I made a number of beautiful landscapes. Just one view to show the possibilities—Manorkill Falls (Figure 1, Page 182), one of the feeders of the new reservoir. Then on as far as Grand Gorge, returning to Kingston.

The town of Kingston was founded in 1610 by Hollanders, who established a trading post; Norwegians, Dutch, French, English and Germans came later. In 1652 a permanent settlement was made. At that time the whole region went under



OLD SENATE HOUSE.

Figure 2.

Illustrating article "In Old Kingston, N. Y.," by William H. Broadwell.

the name "The Esopus." It became Kingston when this section came under the control of the British.

Of the many old houses still standing, probably the most interesting as well as picturesque is the one built in 1676 by Wessel Tenbroeck and known as the "Senate house" (Figure 2). This is now a museum owned by the state. It was here the first state senate met until the burning of Kingston, in 1777, by the British. It is on the main highway.

The next most interesting is the old academy (Figure 3), founded in 1774, now occupied by a newspaper plant. Here was educated the first Governor of New York, Gov. Clinton, as well as other prominent men—Vanderlyn, the artist, Thos. DeWitt, D.D., Livingston, Van Rensselaer and many others.

Kingston is one of the few old places that really make you forget the present and live again in the past. Wherever you go some old house looms up before you, all in a perfect state of preservation. The Tappen house, wherein lived Christopher Tappen, the patriot and statesman; the Elmendorf house, onetime tavern; the Sleight house, now owned and occupied by the D. A. R. Col. Abraham Hasbrouck, Generals James and George Clinton.

One of the views made there is not historical at the present time but will soon become so. This is the chain ferry from Rondout to Kingston Point (Figure 4). This antiquated ferry is owned and operated by an influential resident, and is a highly paying proposition during the height of the touring season. It is scarcely more than a cable's length from shore to shore—no ferry-house on either side—is operated by a chain by which the boat is pulled across by its own power. The boat's capacity is six average size automobiles, and tourists are obliged to wait in turn often two hours or more before they can get aboard the boat. On each side of the creek leading from the landings are long, steep and dangerous roads.

This view was taken under trying conditions. In order to get in all I wished to make a record picture, I was obliged to take it against the light. I wanted first, the boat, then the landings on both sides in order to show the shortness of the ferry, and, finally, a part of the hilly road on the far side with automobiles awaiting their turn to cross.

I was informed that this summer would see the last of this



Figure 3.
FIRST NEW YORK STATE ACADEMY.
Illustrating article "In Old Kingston, N. Y.," by William H. Broadwell.

famous ferry, as a bridge was being built to take care of the traffic using that road at the present time, and would be in operation within a year.

Views of this sort are the kind that all photographers historically inclined should be on the watch for to photograph and preserve for posterity. I am glad to learn that many have followed my advice on the matter as published in the *Annual* for 1911, page 45, and many in all parts of the country are now making records of just such subjects. Let the good work go on.

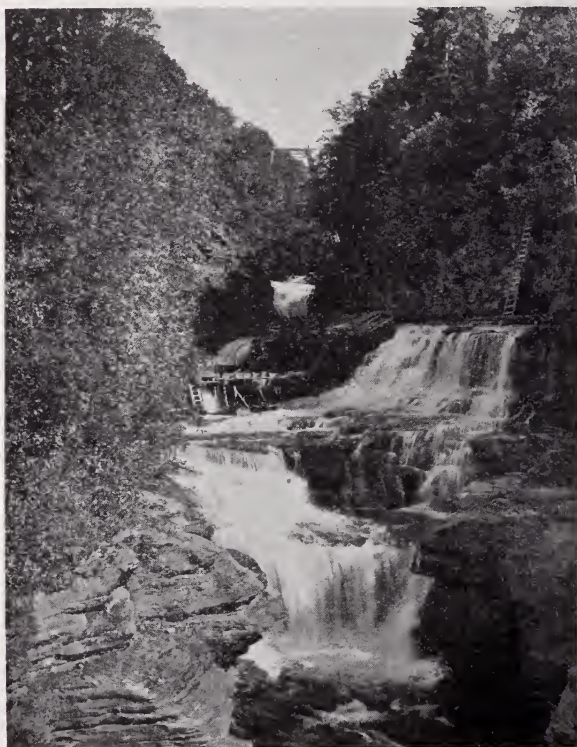


Figure 1.

MANORKILL FALLS, N. Y.

Illustrating article "In Old Kingston, N. Y.," by William H. Broadwell.



Figure 4
THE OLD FERRY, KINGSTON TO RONDOUT, N. Y.
Illustrating article "In Old Kingston, N. Y.," by William H. Broadwell.

PHOTOGRAPHIC METHODS OF TESTING DEVELOPERS

By J. I. CRABTREE

Research Laboratory, Eastman Kodak Company, Rochester, N. Y.



ONE of the many problems assigned to the Photographic Department of the Research Laboratory of the Eastman Kodak Company is the working out of better developing formulæ, which involves the testing of developers submitted from outside sources. Years of experience in this connection has shown that only a surprisingly small number of different developing formulæ are necessary to successfully develop every type of emulsion, and that in spite of the numerous developing agents of varying chemical composition at present available, pyro, Elon, and hydroquinone still remain unequalled though para-amidophenol, glycin, methyl-o-amidophenol, and diamidophenol are useful for special purposes.

Instead of adhering strictly to the manufacturer's published formulæ almost every photographer has his own pet formula with a reputation in many cases entirely undeserved, because the formula was not compared with the manufacturer's formula under equally favorable conditions. These remarks apply also with regard to developing agents. Some photographers use developing agents of unknown composition with supposedly mysterious properties, although careful comparative tests would undoubtedly prove that the developing agents in question are no better than the standard known developers.

In this article it is the object of the author to explain how by simple tests the photographer may judge the merits of any developing agent or developing formula with accuracy.

Two methods of testing are possible:

1. The absolute method, by means of which the various properties of a developer are expressed numerically, and
2. The comparative method, whereby the developer to be tested is compared side by side and under identical conditions with a standard developer.



A. J. Weis.

The first method is obviously the ideal one, because if we can measure the properties of a substance and express them in numbers, then we really know something about that substance. Without the necessary apparatus, however, it is not possible for the photographer to express his various tests numerically, but by comparing a developer side by side with a standard, he is usually in a position to judge the merits of the developer with sufficient accuracy for all practical purposes.¹

Classification of Developers.

In photographic practice, the word "developer" is used synonymously with a developing agent—a complete developing solution ready for use—and a developing formula, so that developers may be classified as follows:

1. Developing agents.
 - a. Composition known.
 - b. Composition unknown.
2. Developers ready for use.
 - a. Composition known.
 - b. Composition unknown.
3. Developing formulæ.

1-a. In order to test a developing agent of known composition, say hydroquinone, it should be compared with a known pure sample of the same developing agent, by compounding a standard developing formula with both chemicals and then comparing the two developers so obtained.

A suitable standard developer formula is the following:

	<i>Metric</i>	<i>Avoirdupois</i>
Developing agent.....	5 gms.	75 gr.
Sodium sulphite (E. K. Co.)...	50 gms.	1 2/3 oz.
Sodium carbonate (E. K. Co.).	25 gms.	375 gr.
Potassium bromide.....	1.5 gms.	20 gr.
Water to.....	1 liter	32 oz.

1-b. A developing agent of unknown composition is compounded according to the above formula and compared with a known developing formula used for average work. Such a developer, known as MQ-25,² is prepared according to the

(1) Chemical methods of testing developing agents have been fully described by H. T. Clarke (Jour. Ind. Eng. Chem., Nov. 1918).

(2) The suffix 25 means that 25% of the total developing agent consists of Elon. See "A Simplified Method of Writing Developing Formulæ", by C. E. K. Mees, Brit. Jour. Phot., 1917, p. 535.

above formula, using 1.25 gms. of Elon and 3.75 gms. of hydroquinone as the developing agent.

2. A ready-for-use developer is compared with MQ-25 or with a known satisfactory developer.

3. The behavior of a developer prepared according to a new formula is compared with that of the best previously known formula for the particular purpose in question.

The Emulsion to be Tested.

Since the behavior of a photographic material towards developers is usually independent of the support on which the sensitive emulsion is coated, we will refer only to the action of developers on emulsions.

We cannot comprehensively speak of the properties of a developer without referring to the emulsion which is developed, and, vice versa, when speaking of the properties of an emulsion, we refer to them in connection with a particular developer.

Most developing formulæ are particularly adapted for particular classes of emulsions and should be compared on representative emulsions in such classes as follows:

Negative emulsions	{ NC film. Commercial film Process film.
Positive emulsions	{ Positive motion picture film. Seed Lantern plates.
Paper emulsions	{ Velox. Bromide and Artura Iris.

Mixing the Developer

When compounding test developers from the solid developing agent, it is important to weigh out the various ingredients very carefully in order to insure an accurate comparison. Instead of weighing out small quantities of potassium bromide it is more accurate to measure out the required volume of a 10% solution.

Since a developer which gives bad chemical fog is useless, and since more developers are rejected on account of fog than for any other defect, it is important that the rules of mixing developers be carefully observed so that no fogging agents are produced during mixing. As a general rule, the sulphite should be dissolved first, each chemical thoroughly dissolved



WILLOWS.

DR. F. DETLEFSEN.

before the next one is added, and the developer mixed at as low a temperature as possible; otherwise, the developer will give fog even if prepared from the purest chemicals. A report on a developer incorrectly mixed is absolutely worthless, because there is no way of telling whether the fog was inherent in the developer or was a result of incorrect mixing.

To mix the standard formula on page 185 proceed as follows:

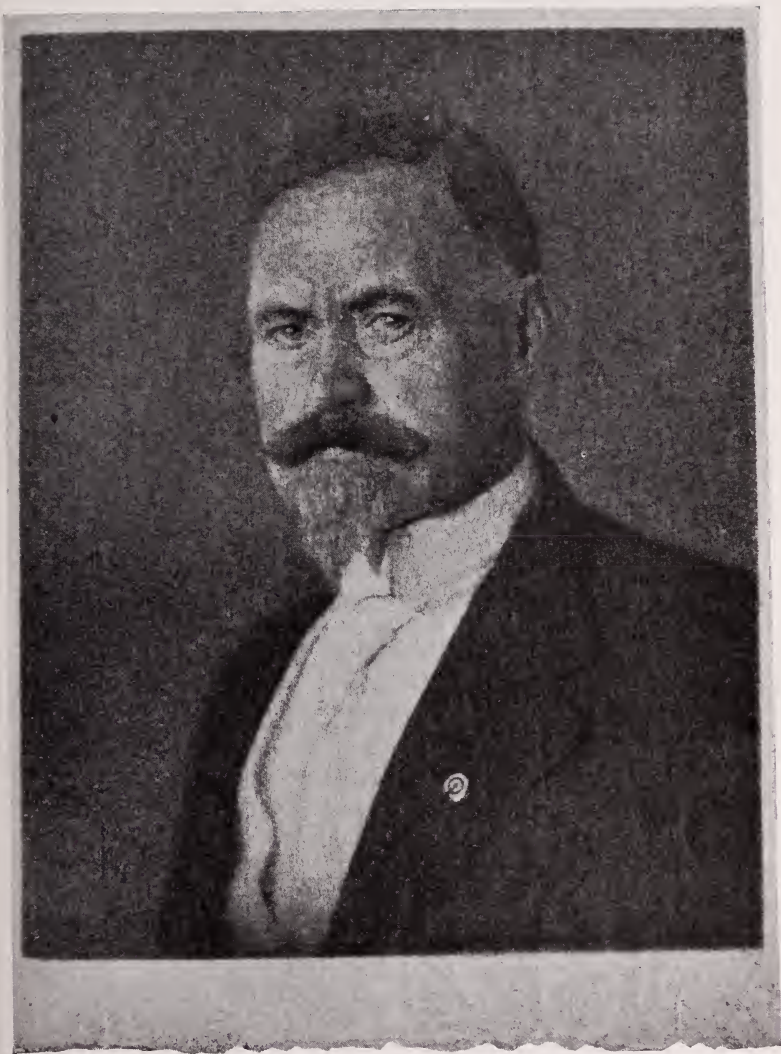
Dissolve the sulphite in about 300 cc. or 10 oz. of luke warm water; then add the Elon or hydroquinone or both, and allow to cool. Meanwhile, dissolve the carbonate in 300 cc. of luke warm water; add the bromide, and cool. Now add the carbonate solution to the sulphite solution and add cold water to make 32 oz. or 1 liter.³

Sensitometric Methods.

When we expose a plate or film in a camera focused on a landscape, we impress upon the emulsion areas of light of varying sizes and of varying brightness. After development the negative consists of areas of varying sizes and varying opacity or density, the relation of the density of a given area to the intensity of the light producing it for the particular emulsion depending upon the developer and the time of development.

The density of any particular portion of a negative is a measure of its capacity for stopping light and is proportional to the total mass of silver comprising that portion. It can be measured by chemical analysis but much more readily by an optical instrument by comparison with a standard density. In the case of an average amateur negative the density of the shadows will average 0.25 to 0.4 and the density of the high-lights from 1.2 to 1.8. One way of comparing the behavior of two developers is to expose two films in a camera on the same subject, giving the same exposure, develop them side by side and compare the densities of corresponding areas of the shadows, middle tones and high lights of the resultant negatives. This method is not entirely satisfactory because very few areas of uniform density are large enough to permit of measurement and it is not possible to place any two areas which received the same exposure side by side so as to compare the densities visually.

(3) See "How to Prepare Photographic Solutions", by J. I. Crabtree (Brit. Jour. Phot., 1919, p. 365); also, "Chemical Fog", (Amer. Ann., 1919, p. 20)



F. A. CHURCHILL.

Artatone Print.

DR. C. F. RODGERS.

It is much more simple, therefore, to expose a negative in steps of gradually increasing exposures so as to correspond with the shadows, middle tones and high lights of a subject and use these graded test strips in place of actual camera exposed films because the developed strips may be placed side by side and a comparison made of the densities of steps which received identical exposures.

How to Expose a Step Negative.

When measuring the characteristics of a developer in absolute units, it is necessary to use a standard light source and a special rotating disk or drop shutter for obtaining the graded exposures, but for comparison purposes it is simply necessary to give the test emulsion about 6 different steps in exposure, the lowest step being given such an exposure that after development the step will be just visible. The exact ratio of the exposures of the various steps is not important but should be of the order 1, 2, 4, 8, and 16.

To prepare a number of test strips, proceed as follows :

Take a 5 x 7 or 8 x 10 sheet of the film coated with the particular emulsion to be tested (see page 186), place in a printing frame, and cover with an opaque card. Now, make a preliminary test to ascertain the distance from the exposing light so that an exposure, say of 2 seconds, is required to produce a just visible deposit on the film when developed in the standard developer for an average time. Then, place the frame containing the sheet of film to be exposed at this determined distance from the light source, and shift the card so as to expose a strip of the film in the frame for 16 seconds. Then expose new steps after the expiration of 8, 4, 2, and 1 seconds respectively. The last step should be unexposed so as to serve as a fog test strip. The various steps have, therefore, received exposures of 0, 2, 4, 8, 12, and 32 seconds respectively (Figure I). Now, cut the film lengthwise along the dotted lines so as to give a number of graded test strips.

A quicker method than the above, if a large number of test strips have to be prepared, is to expose an 8 x 10 or 5 x 7 sheet of film as above, and develop this without cutting along the dotted lines. This graded strip negative can then be used as a master negative for printing test strips, the printing ex-

posure being so adjusted, as described above, that the least exposed step is just visible after development.

For purposes of comparing developers, the exact ratio of the exposures for the various steps is unimportant, though it is not advisable to make the ratio of successive exposure steps greater than the power of 2.

In some cases it is sufficient to make comparative tests on

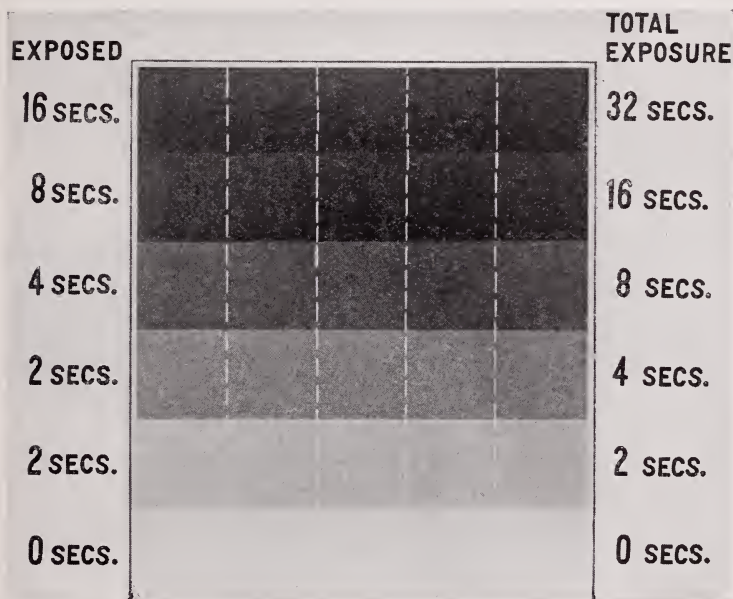


Figure 1.

Method of Exposing Test Film and Cutting Into Graded Test Strips.

strips of film which received only one step in exposure, which are known as "flashed strips." To prepare a number of flashed strips expose one half of a large sheet of film so that after development the density will be a little less than unity. This would correspond to a middle tone of an average negative, and objects should be just visible on looking through the flashed half of the developed film. The unexposed half serves for the fog test. The large sheet should then be cut lengthwise so as to give a number of test strips which all received the same exposure.

The Use of Graded and Flashed Test Strips.

Flashed strips give only a comparative measure of the maximum density produced by the developers. When comparing two similar developing agents for purity or when comparing contrast developers, flashed strip tests usually supply all of the information required. If developers are to be compared for detail rendering power and for contrast, then graded strips should always be used.

How to Interpret Test Strips After Development.

After development, the graded test strips will appear as in Figure 2. The lowest step, *a*, is a measure of the fog produced by development, since this step did not receive any exposure.

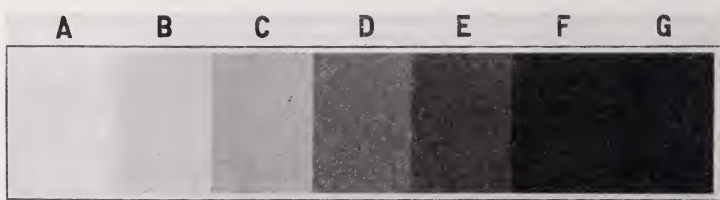


Figure 2.

A Step Negative As It Appears After Development.

Always think of the first step, *b*, and the last step say, *g*, as corresponding to the shadows and highlights in the subject photographed, the intermediate steps corresponding to the various tones of the subject. The density of *b* is a measure of the detail giving power of the developer, while the difference between *g* and *b* gives the density contrast. In the case of developers required to render a minimum exposure, say for high speed photography, the difference in density between *a* and *b* should be as great as possible with enough difference between *b* and *g* to give a sufficiently contrasty print, but with a developer intended for, say, line work, the density of *a* should be as low as possible; that is, the developer should be free from fog, while that of *b* and *g* should be as great as possible.

Factors to be Considered when Comparing Developers.

An ideal developer is one which will develop rapidly, give good contrast and shadow detail without producing chemical



HIGH SEAS.

Joseph Petrocelli.

fog, and which will deteriorate only slowly; that is, if it has good keeping qualities. Other factors are of less importance. The specifications of ideal developers for various purposes, of course, differ. For instance, if the most is to be secured from an under-exposed negative, it should be developed in a tray with a developer containing caustic alkali, this developer keeping active for only a very short time. In the case of amateur finishers' and motion picture film laboratories, a developer is required which will develop a normally exposed negative in from 5 to 15 minutes, but the developer must also keep in active condition for 2 or 3 weeks.

In order, therefore, to enable the reader to interpret the results of his tests, it is necessary first to study the various characteristics of a developer as follows:

1. THE DEVELOPING POWER

When we speak of "developing power," we are using a somewhat vague term in an attempt to sum up several characteristics of the developer in one word. An accurate description of a developer cannot be given briefly, because one developer may be very powerful as regards giving extreme contrast regardless of time, while another may be very energetic and give a normal negative quickly, but is incapable of giving extreme contrast. We may consider "developing power," therefore, as being made up of the following factors:

(a). *Time of Appearance of the Image.*

Every photographer has observed that after placing the negative in the developer, the time required for the first signs of the image to appear varies with different developers. The time of appearance is not an exact measure of the speed of development, because this depends also on the rate of diffusion of the developer and reaction products in and out of the gelatine film, though as a rule with a rapid working developer the time of appearance is short.

With a developer of the Elon type, the time of appearance is very short, but the image subsequently builds up slowly. With hydroquinone the time of appearance is much longer, but the image then builds up rapidly. The difference in behavior of these two developers is illustrated in Figure 3.

Graded strips which had received the same exposure were

developed in an all Elon developer (MQ-100) and in an all-hydroquinone (MQ-0) developer side by side and a strip removed from each developer at regular time intervals. After 1 minute all the steps were visible on the Elon strip but only the heavier exposures or highlights were visible on the hydroquinone strip. At the end of two minutes, the lower tones corresponding to the shadows in a photograph were just vis-

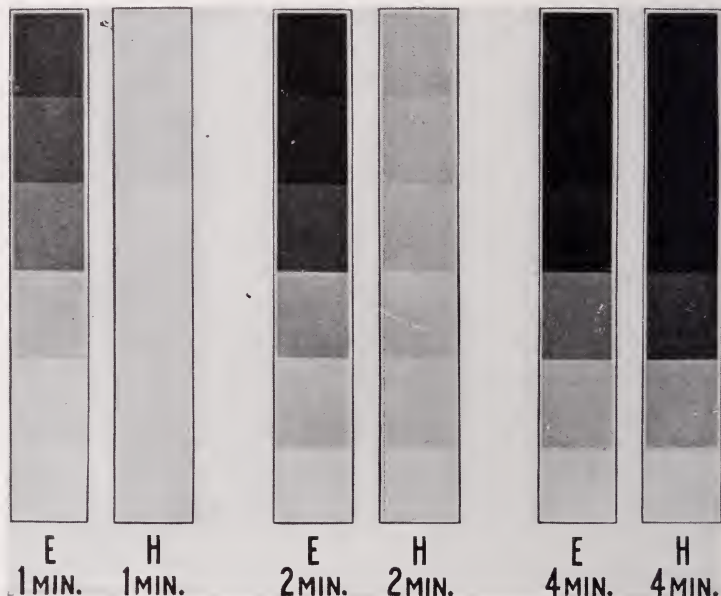


Figure 3.

Developed Graded Strips Showing the Difference in Behaviour Between Elon and Hydroquinone.

ible on the hydroquinone strip, but at the end of 4 minutes both strips looked almost alike.

When using developers of the Elon type, if the image is examined by inspection, the photographer is apt to remove the film from the developer too soon, because he is misled by the rapid appearance of the image, though from the above it is seen that to secure the same density contrast, it is necessary to develop for almost the same time. We say, therefore, that Elon has a high development factor and hydroquinone a low



KATE MATTHEWS.

DAWN.

one, the development factor, or Watkins factor, being equal to the total time of development divided by the time of appearance of the image.

When comparing two developer samples, say hydroquinone, by testing developers prepared from them according to the same formula, the time of appearance of the image is inversely proportional to the percentage of pure developing agent in the samples. With other developers it is a rough measure of the detail rendering power; that is, if the image flashes up quickly and the negative is not over-exposed, then we are reasonably sure that all the shadow tones will be developed out.

(b). The Rate of Development after the Image Appears.

Development consists in reducing the exposed grains of silver bromide contained in the emulsion to metallic silver. All the grains do not commence to develop at the same time, because they are distributed throughout a more or less thick layer of gelatine, but the rate at which the grains develop as a whole depends on the number of unexposed grains remaining to be developed. Therefore, as development proceeds and the number of undeveloped grains remaining become smaller, a fewer number of grains develops in each minute until finally it is not worth while to prolong development, because the unexposed grains then commence to be reduced to silver at a greater rate than the remaining exposed grains.

The growth of the image as a result of the development of the silver bromide grains is referred to as the growth of density, and in the case of a graded strip negative the density of the middle steps increases in the same proportion, but the lower and higher steps do not grow quite so fast. Figure 4 represents a cross section of a strip negative developed for, say, 1 minute. The difference between the lowest and highest steps (ab) or density contrast is very small. On prolonged development each step has increased in density, and the density contrast (cd) is much greater than (ab).

The density contrast of a negative is governed both by the difference in brightness between the high lights and shadows of the subject and by the degree of development of the negative. In order therefore to maintain the density contrast of a batch of negatives as constant as possible, films exposed on a flatly lighted subject should be fully developed, but those ex-

posed on a contrasty subject should be developed to a less extent.

Density contrast should be carefully differentiated from *general density*. An over-exposed and under-developed negative will have good density in the shadows, but the highlights will not be much more dense; that is, the negative as a whole will look dense but the density contrast will be small. The *maximum density contrast* is the greatest density contrast

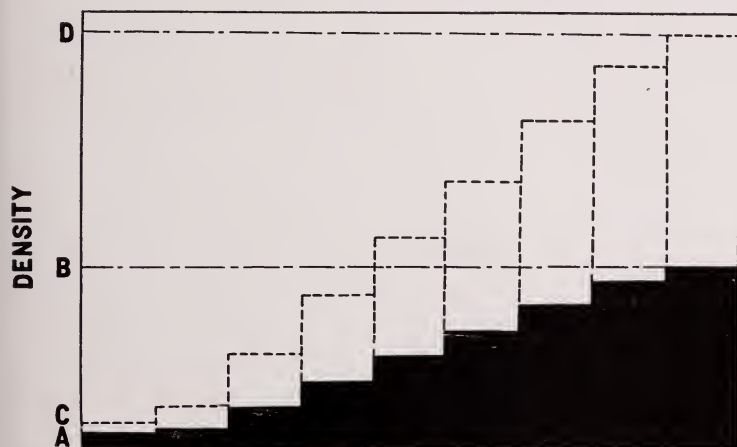


Figure 4.

Showing the Growth of Density of the Image During Development. obtainable by prolonged development until fog begins to form at a greater rate than the image.

As regards maximum density contrast and speed of development, developers fall into four classes as follows:

(a) High maximum contrast and high speed of development; that is, the negative rapidly obtains great general density and contrast. In terms of the step negative (Figure 2, page 192), the density of *b* is fairly high and the density difference *g-b* is great also. Developers of this type are Elon-hydroquinone or pyro developers in combination with caustic alkali.

(b) Low maximum contrast and high speed of development. Elon developers are of this type; that is, the image flashes up but fails to build up general density. In terms of the step

negative, the density of b is fairly high, but the difference $g-b$ is comparatively small.

(c) High maximum contrast and low speed of development. Hydroquinone is a typical developer in this class; that is, the image appears slowly and development proceeds fairly slowly, but good density and contrast are finally obtained.

(d) Low maximum contrast and low speed of development; that is, the image appears slowly and development proceeds slowly, so that good contrast is never obtained.

(c) *The Power of the Developer to Render Visible a Minimum Exposure.*

For most photographic work this property of the developer is perhaps the most important. Contrast in a negative is not so important nowadays in view of the large variety of printing media of varying contrasts to take care of negatives of varying contrast. Referring to the step negative (Figure 2, page 192), the detail giving power of the developer is measured by the difference between the density steps a and b . This is obviously the greater the less the fogging power of the developer. The detail giving power is usually lowered by the addition of potassium bromide, which addition is analogous to cutting off the same amount of density from each step.

The relative effect of bromide on density is greater on the first step than on the last, and this is why when testing a developer it is advisable to omit the bromide from the test formula. With some very energetic developers, however, it is advantageous to add a certain amount of bromide because in some cases bromide restrains fog more than the image. In other words, suppose that in 5 minutes without bromide step b had a density of 0.4 and then fog commenced to form. In the next 5 minutes, suppose a fog density of 0.2 was formed and the total density of b only grew to 0.5. The effective density contrast is, therefore, 0.3. Now, suppose the addition of potassium bromide cut down the density of step b to 0.45 and cut the fog down to 0.05. Then the density contrast or effective density of b is 0.4, showing the advantage of adding bromide.

2. CHEMICAL FOG

When comparing developers, we are only concerned with developer fog and not with fog inherent in the emulsion. De-



a Fine Morning

RE
Vr.
1921

veloper fog is caused by impurities or oxidation products of the developing agent formed during mixing. The importance of careful mixing of developers for test purposes is therefore apparent (See page 186 "Mixing the Developer").

Interesting facts about fog are that the fog layer is not distributed evenly over the entire image, but is thinner in the highlights because in those places where more image is developed, more potassium bromide is formed as a reaction product of development which therefore restrains the fog adjacent to the denser portions.

The absolute amount of fog depends on the volume of developer used. A film developed in a small volume of developer will have slightly less fog than if developed in a large volume, because in the former case the concentration of the bromide produced during development is greater.

Practical Determination of Fog.

Fog measurements are usually made by determining (a) the time required for fog to become just visible, and (b) the total fog density formed when development is complete.

(a) I. It has been found that a slow positive emulsion such as a lantern slide emulsion or motion picture positive emulsion, although very free from fog is very sensitive to the presence of impurities in the developer, and these emulsions are therefore very suitable for fog tests.

To make the test, first immerse one half of the unexposed film in the developer and then, after one minute, completely immerse the film. Fog will therefore appear on the first half sooner than on the second half, and the time for the dividing line to become visible is taken as the fogging point.

(b) II. The total fog density is given by the density of the end or unexposed portion of the developed graded strip (Figure 2, page 192). After the fog once appears its rate of growth is proportional to the time of development, that is, if the fog appears in two minutes and reaches a density of say, 0.2 in 4 minutes, then the fog density in six minutes will be around 0.4.

The total fog formed after developing to an average contrast is usually proportional to the time of appearance of the fog, though as seen from the curve in Figure 5, it is possible that two developers in five minutes, say, might give the same fog, but in three minutes the fog densities might be quite dif-

ferent. It is important, therefore, to consider both the time for fog and the total fog formed when development is complete.

Without a density measuring instrument the fog is most easily judged by laying the film, emulsion side down, on a sheet of white paper. With positive emulsions, such as lantern slides and motion picture positive film, no fog is permissible, but in the case of negatives, a very slight veil invariably forms by the time sufficient contrast is gained.

If a developer, which is otherwise satisfactory, gives excessive fog, the effect of the addition of a little potassium bromide should be tried before rejecting the developer. In the case of

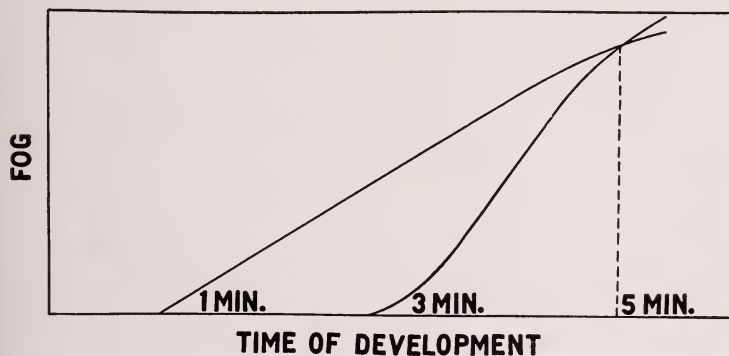


Figure 5.

Curves Showing the Rate of Growth of Fog During Development.

an energetic developer of the caustic-elon-hydroquinone type, bromide exerts a greater restraining action on the fog than on the image, so that increasing amounts of bromide should be tried up to, say, five grams per liter, noticing carefully the effect on the lowest density and the density contrast of the graded test strip. If the fog is reduced to practical limits, and the density of the lowest step is not diminished to an extent equal to the original fog density, and if the density contrast is likewise not diminished, then the fog has been effectively eliminated.

3. LIFE OF THE DEVELOPER

The active life of a developer is determined by

(a). The time required for the developer to oxidize by virtue

of contact with the air, and, therefore, become useless either as a result of exhaustion or because of fog resulting from the oxidation products of the developer.

(b). The useful work which the developer will perform; that is, the number of films or prints developed when the solution is used continuously.

(a). The resistance of a developer to aerial oxidation is called the "keeping power" and is determined by measuring, say, 500 cc. or 16 oz. of developer into an open tray, allowing this to stand at room temperature, and making graded strip tests at frequent intervals, preferably daily. Before making the daily tests, the volume of developer should be brought up to the original five hundred cc. with water, so as to compensate for loss by evaporation.

The keeping test should always be made in comparison with a standard, known developer.

As the developer becomes oxidized, it usually turns dark brown in color, though the rate at which a developer darkens in color is no criterion of the rate of exhaustion, because some developers darken slightly the first day of exposure and do not darken further on keeping, though the developer might be totally exhausted on the third day. An unused MQ (Elon hydroquinone) developer which on standing in a closed bottle turns slightly yellow and opalescent should be regarded with suspicion.

Keeping power is of great importance in the case of developers intended for use in tanks such as in motion picture and amateur finishing work. It is of less importance for tray development.

If the developer refuses to develop after standing in an open tray for two or three days at 70° F., it is useless for tank work. In the case of a developer with good keeping properties, the maximum density on the test graded strip will usually drop to about one half in three or four days when applying the above test.

(b). The *useful* work test is made by exhausting the developer by developing a number of films or prints for a definite time in a definite volume of developer and noticing the time of appearance of the image and the point at which a change in color or a weakening of the image occurs.

In practice, while the developer is being exhausted by virtue of developing the image, it is also being exhausted by aerial oxidation as a result of agitation, so that a strict exhaustion test could only be made by the impractical method of surrounding the developing tray or vessel with an atmosphere of an inert gas, say nitrogen, so as to prevent aerial oxidation.

The only final life test, therefore, is to exhaust the developer under actual working conditions.

If the developer oxidizes rapidly an exhaustion test is not of much value, so that the keeping test should always be made first, and then an exhaustion test made if the developer appears promising.

4. COLOR OF IMAGE

The color of the image is of most importance when developing paper prints and motion picture positive film. As a rule, Kodolon gives a grayish, hydroquinone a black, and Amidol a blue-black image.

Tests for color should always be made by cutting the test strips from a single sheet of film or paper, so as to insure that the tests are made on the same emulsion.

In the case of a negative, the color is of less importance, because the quality of the negative is determined by the final print which it produces. The only colored negative images met with in practice are those given by pyro. Elon-hydroquinone images are termed "neutral deposits."

With pyro, the yellow stain, which is an oxidation product of pyro, may be distributed uniformly over the image, in which case the effect is the same as if a yellow filter had been placed over the negative; i.e., it increases the printing exposure. The stain may also consist of image stain, in which case each developed grain of silver is combined with more or less oxidation product stain, so that the pyro stained image is composite and consists of a neutral silver image and a yellow stain image, the latter image, therefore, adding to the contrast.⁵ It is for this reason that a yellow stained pyro negative gives a more contrasty print than an apparently similar negative developed in a non-staining developer. When comparing negatives developed with pyro, therefore, always compare prints made from the negatives and not the negatives alone.

(5) See article on "Stains on Negatives and Prints," *Amer. Ann.*, 1921, p 204.

For negative work, a developer is to be preferred which gives a fairly colorless deposit, because in the case of a pyro stained image the quantity of stain depends on so many factors, such as the time and temperature of the developer, the time of rinsing, the nature of the fixing bath, the time of washing, etc., that it is almost impossible to control the quality of the pyro stained negatives obtained. When judging two developers, one of which gives a neutral deposit, and the other a pyro stained image, providing the two developers compare favorably as regards the capacity for rendering detail, fog, contrast, and keeping power, the developer which gives the neutral deposit or non-stained image is to be preferred.

MISCELLANEOUS FACTORS FOR COMPARISON

(a). *Effect of Dilution.* In many cases it is desirable to be able to dilute a developer so as to secure a certain contrast in a definite time, though, contrary to a popular notion, prolonged development with a weak developer does not always give better results than shorter development, say 5 minutes, in a stronger developer, and in many cases the results are inferior.

Pyro behaves normally on diluting up to three or four times; that is, the time of development is inversely proportional to the dilution, or if one volume of developer is diluted with, say, two volumes of water, in order to secure the same contrast the negatives should be developed for three times as long. The fog values for equal contrasts are likewise approximately equal.

A dilute developer, however, oxidizes more rapidly than one which is more concentrated, the rate of oxidation being roughly proportional to the sulphite concentration. Sodium sulphite at strengths higher than 10% to 15% oxidizes more or less slowly, but very rapidly at strengths below this. This is very apparent with developers intended for use with a reel and tank outfit. If the developer contains 10% to 15% of sodium sulphite, very little fog forms on churning up the developer, but if the developer is diluted with only 50% of water, fog may begin to form very rapidly.⁶

With Elon-hydroquinone the time of development is roughly inversely proportional to the dilution up to a dilution of one to three, though there is a tendency for the weak developer to give

⁶ See Article "Chemical Fog" (*Amer. Ann.* 1919, p. 20).



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more fog than the stronger developer when developing to a given contrast. Beyond a certain dilution prolonged development does not increase contrast, because fog grows at a greater rate than the image.

A glycin developer will withstand more dilution than any other known developer and still behave rationally, and for this reason glycin has long been a favorite developer for tank work.

(b). *Effect of Temperature.* With developers such as hydroquinone, development proceeds very slowly at low temperatures, so that a developer of this type, as compared with an Elon-hydroquinone developer tested under arctic conditions would prove very unsatisfactory. For tropical work, a developer is required which will not cause undue swelling of the gelatine or excessive fog.

(c). *Alkalinity.* A developer which is strongly alkaline shortens the life of the acid fixing bath because the acid in the latter is rapidly neutralized by the alkali in the developer carried over by the films and prints, and under such conditions the films and prints are likely to become stained.⁷

Excessive alkali also tends to soften the gelatine film, so that, other factors being equal, a developer containing a minimum of alkali is to be preferred.

(d). *Cost.* The cost of the developer per unit of work performed is calculated by dividing the total cost of the developer (including labor) by the total area of the films and prints developed measured in square feet. A developer which is more expensive as regards chemicals but which has a long life is often cheaper in the long run because the extra cost of chemicals is more than offset by the saving of labor and perhaps tie-up involved when mixing a new batch of developer.

(e). *Physical and Chemical Properties.* The solubility, color, and crystalline form are of importance. A developing agent which is readily soluble in cold water and is white and crystalline is always to be preferred.

Developers of the monomethyl paraminophenol type are readily precipitated by a solution of sodium sulphite, which in many cases makes it impossible to prepare the developer in the highly concentrated form.

⁷ See Article on "Stains on Negatives and Prints" (Amer. Ann. 1921, p. 204).

PRACTICAL EXAMPLES

The following examples illustrate the methods of presenting reports on the various types of developers:*

1. Report on a Sample of Hydroquinone.

The sample was compared with a known pure sample of hydroquinone by first compounding the following MQ₀ formula with each sample:

	<i>Metric</i>	<i>Avoirdupois</i>
Developing Agent.....	5 gms.	75 gr.
Sodium Sulphite (E. K. Co.)..	75 gms.	2½ oz.
Sodium Carbonate (E. K. Co.)	25 gms.	375 gr.
Potassium Bromide.....	1.5 gms.	20 gr.
Water to make.....	1 liter	32 oz.

Sheets of flashed motion picture positive film were developed in each developer side by side at 70° F., and keeping tests made by exposing the developer for 24 hours in an open tray, taking care to dilute the developer to the original volume before testing each day in order to compensate for evaporation.

	<i>Sample</i>	<i>Standard</i>
Time of Appearance....	65 seconds	65 seconds
Time of Appearance after 24 hours.....	165 seconds	160 seconds
Density in 6 minutes....	1.94	2.00
Density after 24 hours..	0.85	0.86
Time for fog at 70° F..	11 minutes	12 minutes

The above results show that the sample consists of practically pure hydroquinone. Although the sample contains a trace of colored impurity which produces a little fog, this would be negligible in practice.

2. Report on a Sample of Elon Substitute.

The sample was compared with pure samples of Elon and Kodelon (paraminophenol hydrochloride) by compounding the MQ₀ formula and testing on sheets of flashed motion picture positive film, as follows:

<i>Developing Agent</i>	<i>Time of Appearance</i>	<i>Time for Fog at 70° F.</i>	<i>Density in 6 Minutes</i>	<i>Fog</i>
Elon	7 seconds	10 minutes	0.75	0.05
Sample	14 seconds	6 minutes	0.62	0.05
P. A. P.....	30 seconds	16 minutes	0.49	0.03

*In the absence of a density measuring instrument the photographer can visually compare densities with sufficient accuracy by placing the two graded or flashed strips side by side and examining the density of corresponding steps when looking through them against a uniformly illuminated light source such as a uniform sky. The lowest densities are best compared by laying down on a sheet of white paper.

From the above it is seen that the sample stands about half way between paraminophenol and Elon in its photographic behavior. (Since the sample was so remote from Elon, it was unnecessary to make further tests).

3. *Report on the Developing Agent "X".*

The developing agent "X" submitted consisted of light gray flakes, which were readily soluble in water and very readily precipitated by sodium sulphite. Preliminary experiments having shown that the developer behaved in a manner very similar to Elon, it was required to determine whether the developer became exhausted at a greater rate than Elon. Developers were, therefore, compounded with equal weights of Elon and the sample "X," according to the MQ₀ formula (Page 207), and sheets of flashed motion picture positive film developed in each developer for 7 minutes at 70° F. The films were developed consecutively without loss of time so as to eliminate as far as possible errors due to oxidation of the developer, and the time of appearance noticed in each case. The results were as follows:

<i>1st Sheet</i>		<i>10th Sheet</i>		<i>20th Sheet</i>	
<i>Time of</i>		<i>Time of</i>		<i>Time of</i>	
<i>Appearance</i>	<i>Density</i>	<i>Appearance</i>	<i>Density</i>	<i>Appearance</i>	<i>Density</i>
Elon ... 5 seconds	2.5	12 seconds	1.5	40 seconds	0.98
Sample X 5 seconds	2.2	16 seconds	1.4	56 seconds	0.90

From the above tests it is seen that the sample X compares favorably with Elon as regards its photographic behavior although the color of the silver image produced was decidedly bluer than that given by Elon.

REPORTS ON DEVELOPING FORMULÆ

For practical purposes developing solutions may be divided into five classes as follows:

1. *Developers for average work.*

- a. Negative developers (tray and tank).
- b. Paper developers.

Tests on these developers should include developing power, life, color of image, fog, etc.

2. *Developers for under-exposed negatives.*

These developers should be tested against the following formula, which is the best present known formula for under-exposure work:



AUTUMN ASPENS.

EDGAR A. COHEN.

	<i>Metric</i>	<i>Avoirdupois</i>
Sodium sulphite.....	60 gms.	2 oz.
Elon	16 gms.	250 gr.
Hydroquinone	16 gms.	250 gr.
Caustic soda.....	10 gms.	150 gr.
Potassium Bromide.....	10 gms.	150 gr.
Water to.....	1 liter	32 oz.

Then add Wood or Denatured

Alcohol 50 cc.

If this developer gives too much contrast, reduce the negative with ammonium persulphate.

Preliminary tests should be made on flashed film, giving such an exposure that a just visible deposit is given by the above developer, in, say, 3 minutes. If the formula to be tested compares favorably with the above, a final test should be given by cutting a camera exposed film in two and developing one-half in each developer.

3. *Contrast Developers.*

a. Short life type.

b. Long life type.

The best contrast developer known to date is the following:*

Solution A.	<i>Metric</i>	<i>Avoirdupois</i>
Sodium Bisulphite.....	25 gms.	375 gr.
Hydroquinone	25 gms.	375 gr.
Potassium Bromide.....	25 gms.	375 gr.
Water to make.....	1 liter	32 oz.

Solution B.

Caustic Soda..... 45 gms. 1½ oz.

Water to..... 1 liter 32 oz.

Use equal volumes of A and B.

This developer will not keep, so that for tank work a comparison should be made with the formula given in the report below, which has much better keeping qualities, but does not give as much contrast as the formula above.

The following example illustrates the method of testing contrast developers:

Report on a Process Developer Formula for Tank Work.

The formula submitted was compared with the Eastman

*See "Elementary Photographic Chemistry" p. 48. (Obtainable gratis from the Eastman Kodak Company.)

process Elon-hydroquinone tank developer, the formula for which is as follows:*

	<i>Metric</i>	<i>Avoirdupois</i>
Sodium Sulphite.....	75 gms.	2½ oz.
Elon	1 gm.	15 gr.
Hydroquinone	9 gms.	135 gr.
Potassium Carbonate.....	25 gms.	375 gr.
Potassium Bromide.....	5 gms.	75 gr.
Water to make.....	1 liter	32 oz.

Tests were made on flashed process film, developing for 5 minutes at 70° F., and the tests repeated at intervals, until on standing in open trays the developers were exhausted. The results were as follows:

	<i>1st Day</i>		<i>2nd Day</i>		<i>4th Day</i>		
<i>Developer</i>	<i>Density</i>	<i>Fog</i>	<i>Density</i>	<i>Fog</i>	<i>Density</i>	<i>Fog</i>	
Test Formula....	1.14	.05	.74	.05	.00	.00	Developer reddish brown
Eastman Formula	1.62	.09	1.43	.06	1.03	.04	Developer slightly yellow

The above results show that the developer submitted is inferior as regards developing and keeping power to the Eastman formula.

4. *Ultra Rapid Developer for Recording Paper.*

With many scientific recording instruments the record is made by means of a beam of light reflected from a mirror on to a traveling band of photographic paper. It is often necessary to develop this record almost instantaneously, and for this purpose the following formula is recommended:

	<i>Metric</i>	<i>Avoirdupois</i>
A. Sodium sulphite.....	15 gms.	225 gr.
Elon	10 gms.	150 gr.
Hydroquinone	10 gms.	150 gr.
Sodium sulphite.....	60 gms.	2 oz.
Water to.....	1 liter	32 oz.

Then add 50 cc. of wood or denatured alcohol to keep the Elon and hydroquinone in solution. The sulphite is added in two portions to facilitate solution of the Elon.

B. Caustic soda.....	25 gms.	375 gr.
Water to.....	1 liter	32 oz.

Use equal volumes of A and B.

*See "Booklet Reproduction Work With Films" p. 10. (Obtainable gratis from the Eastman Kodak Company.)

When comparing a new formula with the above, tests should be made on flashed sheets of paper and preference given to the developer producing the greatest density in the shortest time providing the keeping properties are satisfactory.

5. *Deep Tank Developers for Motion Picture Film Work and Amateur Finishing.*

Satisfactory developing formulæ in this class are more difficult to work out than any other developing formulæ because deep tank developers must fulfill so many conditions, as follows:

(a). The developer should give a negative of fixed contrast in a given fixed time. An average time for developing motion picture negative and positive film is five minutes, and fifteen minutes for amateur finishing. The time fifteen minutes is convenient because it takes about ten minutes to load a new rack with films. The time of development is easily adjusted by diluting the developer or making it more concentrated.

(b). The keeping properties should be satisfactory as regards growth of fog with age, non-staining properties, and exhaustion. After the developer has been used for some time, the concentration of potassium bromide, which is formed as a result of conversion of the silver bromide emulsion to metallic silver, increases so that if the developer contains much hydroquinone, which is very sensitive to bromide, shadow detail in the negative is lost. Pyro, Elon, and Ortol are less sensitive to bromide and should therefore predominate in a negative developer. Pyro oxidizes rapidly and gives stain unless an excess of sulphite is added, which in turn tends to produce fog. For motion picture positive work the effect of the accumulated potassium bromide is of less importance, since this can be compensated for by increasing the printing exposure.

In tank work, as the developer becomes exhausted as a result of performing useful work, it is customary to increase the time of development by about one minute per day so as to maintain a constant contrast of the negatives.

Tank developers should be given a thorough exhaustion test by developing camera exposed or flashed films in a deep glass tank containing about half a gallon of solution, a sufficient number of films being developed daily so as to correspond to an average daily run in a fifty or one hundred gallon tank.



STUDY.

JANE REECE.

Graded strip tests should also be made daily and developed to a given density contrast, the density of the lowest steps which are a measure of the detail giving power being carefully noted.

(c). The alkalinity should not be excessive; otherwise, the acid fixing bath soon becomes neutral as a result of the neutralization of the acid by the alkali in the developer carried over by the films.

The following example illustrates the method of testing tank developer.

Report on a Deep Tank Developer Formula for Amateur Finishers.

The formula submitted was tested against the standard formula by first developing flashed sheets of NC film for 15 minutes at 70° F, the tests being repeated after allowing the developers to stand in open trays over night and diluting to the original volume to compensate for evaporation. The results were as follows:

	<i>1st Day</i>		<i>2nd Day</i>	
	<i>Density</i>	<i>Fog</i>	<i>Density</i>	<i>Fog</i>
Test Formula....	1.50	.32	1.40	1.30
Standard Formula	1.06	.20	0.20	0.15

This preliminary test showed that the developer submitted has excellent keeping qualities, so that further exhaustion tests were made by developing the equivalent of five hundred rolls of film per day in fifty gallons of developer for a period of five days. Daily tests were made on graded strips noticing carefully the lowest density and the density contrast. The results were as follows:

	<i>1st Day</i>				<i>5th Day</i>			
	<i>Densities</i>		<i>Density</i>		<i>Densities</i>		<i>Density</i>	
	<i>2nd</i>	<i>6th</i>	<i>Con-</i>		<i>2nd</i>	<i>6th</i>	<i>Con-</i>	
	<i>Step</i>	<i>Step</i>	<i>trast</i>	<i>Fog</i>	<i>Step</i>	<i>Step</i>	<i>trast</i>	<i>Fog</i>
Test Formula.....	0.31	1.60	1.29	0.14	.11	1.21	1.10	0.10
Standard Formula.	0.30	1.20	0.90	0.13	.20	1.01	0.81	0.13

The above results show that although the test formula has excellent keeping properties, as the developer becomes exhausted it loses its power of rendering shadow detail. The developer costs twice as much as the standard formula, but the cost per unit of work is less, since its active life is greater.

Precautions to Be Observed When Testing Developers.

1. Make all tests on film having the same emulsion number.

2. The flashed strips or exposed graded strips must all receive *the same exposure*, especially when making keeping tests at daily intervals. To insure this the exposing lamp should be placed in circuit with a volt meter, and the voltage maintained constant at, say, 110 volts. It is also advisable to adjust the time of exposure so that the exposure required is at least 20 seconds either by varying the distance of the printing frame from the light source, or by placing one or two sheets of opal glass between the lamp and the exposing frame. If an error of one second is made in exposing, the error will then be only five per cent, while if the exposure given is two seconds and an error made of only one-half second the effective error would be twenty-five per cent.

3. The developers to be compared must be at *the same temperature*.

Tests at daily intervals in order to be strictly comparative should be made at the same temperature, although the temperature usually varies only slightly from day to day. Unless a thermostat is available it is better to make the tests at room temperature (which should be stated) providing the temperature of all the test developers is the same, rather than attempt to adjust the temperature to a standard temperature.

4. *The degree of agitation of the developer* relative to the film when making the tray and tank tests *should be constant*, because when the film or developer is agitated the developer in contact with the surface of the film is frequently renewed and the development is much more rapid than when the film and developer are stationary. Handling of the test strips is much facilitated by pinning across a wooden frame with the aid of glass push-pins.

5. When making the exhaustion tests the sheets of film used for exhausting the developer should be half flashed, that is, one-half of the sheet should be unexposed so as to represent an average exposed negative. An average rate of exhaustion is the equivalent of ten sheets of 8 x 10 film per gallon of developer per day for five or ten successive days.

As each successive daily test is made there is a loss of developer from evaporation and from absorption by the gelatine film. In the tanks are covered the loss by evaporation will be negligible.

SNAPPING STATE CAPITOLS

By GEORGE STEELE SEYMOUR



HE collecting mania is strong in man. Whether one be a Japanese and collect male and female ceremonial dolls, or an American and collect picture post cards, it is the same passion. The owner of a camera—a tyro—an amateur with a turn for accumulating negatives, will find his efforts running along certain lines, and so will be established his field for photograph collecting.

I once held to the mistaken notion that a camerist need not snap familiar objects, on the ground that better pictures of them could be bought ready-made. Thus I missed many negatives for which uses have later arisen. When one is far away and suddenly wishes a picture of the bronze palmetto tree at Columbia, S. C., or the totem pole at Tacoma, Wash., it makes no difference that the tourist in those respective localities is overwhelmed by a profusion of them.

My career as a collector of state capitols is thus divided sharply into two periods; the early, characterized by an avoidance of the obvious (due to an overplus of theory and underplus of experience), and the present, in which the proximity of a dome leads automatically to the click of the shutter.

State capitols are difficult subjects, since you must see them from the same point of view from which everyone else sees them, and originality of treatment is almost impossible. Nearly all of them are abundantly domed. At Madison, Wis., the shining white dome dominates a three-cornered structure—three wings radiating from it. The dome is similar to that of the capitol at Washington—the only closer resemblance that I know of is the one at Sacramento. My camera visited Madison on a sunny Sunday, but on the tenth floor of a near-by office building a room was found open, and from the window of this room our view was taken. The anastig-



STATE CAPITOL,
MADISON, WIS.

GEORGE STEELE SEYMOUR.

mat brought out nicely all the fine details, though the view is, of course, without any artistic pretensions.

In "quaint, historic Sante Fe," the field proved more favorable. Down the romantic lane habited by the Mexican maiden, an air of mystery is lent to the undersized building with its unmistakably tinnish dome. The tin dome maker must once have been popular, for at Salem, Oregon, we come across him again. Its neighbor, Olympia, however, resisted his enchantment, and Washington State has adopted as her capitol a brown stone building that would pass creditably for a union station.

Some states have spent millions in the effort to make their official headquarters a focus of art and talent. St. Paul boasts an architectural gem; Harrisburg, with all its reputed graft, is ornately decorated. New York has erected a French chateau on the top of a steep slope—a most unreasonable location, from a photographer's way of thinking. The only way I know of to get it upright on a film is to take it sidewise down Eagle Street. Beacon Hill is famous, and the golden dome at the head of Park Street needs no more introduction than does the replica of a cod-fish that hangs over the Speaker's desk.

Custom seems to have established the dome as a widespread, though not universal, feature of capitology. Certain capitol buildings of the middle west—Lansing, Springfield, Topeka, Lincoln, Denver—are almost duplicates of one another. Possibly some portable house builder or large mail-order concern could let us into the secret of this uniformity. The dome at Des Moines covers much that is of interest—an especially fine law library, for one thing, and a notable wall particularly a museum of transportation in the basement, painting of the coming of the pioneers, for another—but including an immense Conestoga wagon or prairie schooner, with its brown hood spread, just as it used to "cross the prairies as of old." It is an inspiring sight.

But the domeless capital is by no means unknown. Albany I have mentioned. In Baton Rouge is to be found a much earlier French chateau, in, I grieve to report, not nearly such good repair. The crenellated towers set high on the bank of the Mississippi make a picturesque view provided one is far



STATE CAPITOL,
SANTA FE, NEW MEX.

GEORGE STEELE SEYMOUR.

enough distant to be oblivious to the loosened tiles and chipped plaster. On the bank of the Kennebec stands another domeless capitol, though Maine has provided her legislative house with the conventional up-hill site. Delaware has a fine modern colonial structure, of the type of Bullfinch, towered instead of domed. Nashville still uses the antique towered meeting-house of earlier days, while Richmond legislators meet in a Greek temple which does not seek to reflect architecturally the face of its great neighbor upon the Potomac.

History dwells deep in some of these ancient agora. One cannot fail to feel reflective beside the tall columns of the building at Montgomery that sheltered the first congress of the Confederacy. The graceful Georgian state house upon the Severn, in a town as yet undiscovered by railroads, upholds the dignity of its founder, Lord Baltimore, amid surroundings as old and dignified as itself. A statue of Roger B. Taney stands guard over it. In Concord, the statue and memory of Franklin Pierce, favorite son of New Hampshire, protects a building of the conventional type; while in Columbia, the honor of South Carolina is properly set off against an extremely made-to-order structure by the bellicose Wade Hampton in bronze. An effect of greater modernity is achieved in Indianapolis, where Benjamin Harrison stands guard before a state capitol that is not located on a hill and into the building of which many other novel features have entered.

Strangest in its antecedents is the domed palace at Austin, located in spacious grounds at the end of an avenue flanked by statues of prominent citizens. The government of Texas, finding itself in need of an official residence and lacking the million dollars or so needed to build one, contracted with an eastern syndicate for the erection of its capitol and paid for the same with a small empire of the public lands. When you look on the map of Texas and see a great stretch of country in the western part of the state where railroads have not yet entered, that is the so-called "capitol land grant." Who can say whether or not the deal was a wise one?

These are but a few of the memories awakened by my packet of negatives from state capitols.



STATE CAPITOL,
BATON ROUGE, LA.

GEORGE STEELE SEYMOUR.



Figure 3.

THE WILLOW SCREEN

*Illustrating article "On Cultivating the Habit of Observation,"
by William S. Davis.*

ON CULTIVATING THE HABIT OF OBSERVATION

By WILLIAM S. DAVIS

ONE of the most valuable—indeed essential—assets for the photographer is the power of accurate and keen observation of the multiplicity of elements constantly met with. Many people who possess good eyesight and a normal allotment of "grey matter" go about their daily tasks with only sufficient knowledge of the aspect of objects and persons to recognize acquaintances and surroundings on sight. This limited perception, which precludes an understanding of the more subtle changes constantly taking place and the reasons therefor, is not due to inability to comprehend more, but purely to undeveloped powers of observation, these being in



Figure 2.

BY THE RUSH FRINGED BANK

*Illustrating article "On Cultivating the Habit of Observation,"
by William S. Davis*

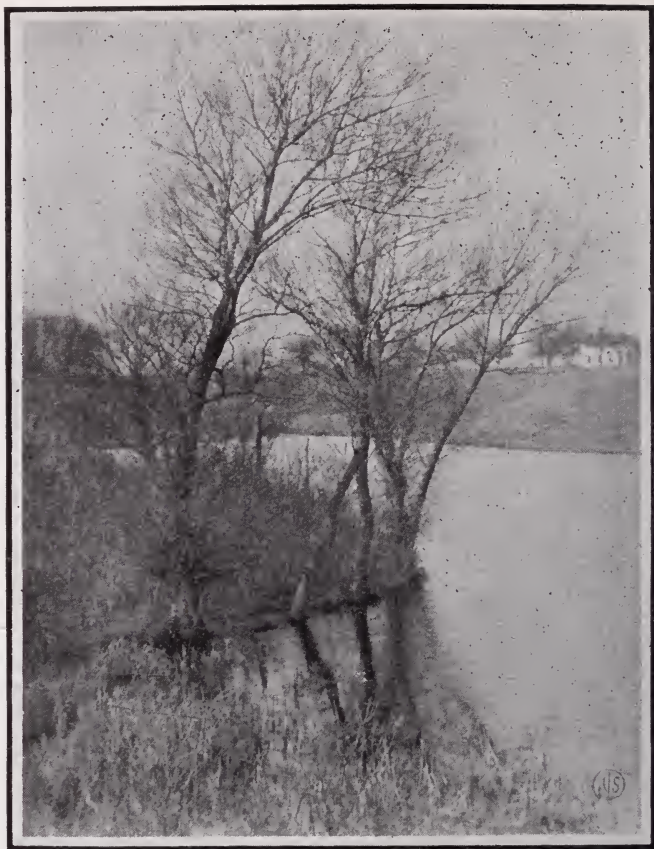


Figure 1.

IN APRIL

*Illustrating article "On Cultivating the Habit of Observation,"
by William S. Davis.*

need of cultivation before it is possible to enjoy to the fullest the beauty, and varied aspects, of whatever material is presented to the eye.

No matter how far a pictorialist may choose to depart from a literal rendering of facts it is necessary to have an understanding of such matters as details and forms of natural objects, and what changes are to be expected from differences in lighting, etc. before it is possible to select and reject intelligently from the mass of material open to choice, since even the most imaginative idea must, if it is to be rendered



EVENING IN THE PARK.

R. B. M. Taylor.

clear to the spectator, be expressed by means of familiar forms which serve as symbols.

Nature is in a continual state of flux, every leaf and blade of grass slowly but surely undergoing changes which ultimately become visible to the most casual observer, while even those objects which are supposed to remain in a static condition are greatly altered in outward aspect according to the time and conditions under which they are seen.

One of the best ways to stimulate the habit of observation known to the writer is to select some subject of easy access and watch the variety of transformations which will occur from such causes as change of season, angle of lighting at different hours of the day and night, atmospheric conditions ranging from clear sunshine to fog, rain, and driving snow, and of course the alteration in grouping of lines and masses to be noted from various viewpoints.

While the habit of visual observation should be cultivated until it ceases to be a conscious effort it is a decided help to supplement this with camera or sketch-book. Even though one may not possess real skill with the pencil the effort of trying to draw an object will tend to increase the keenness of observation, since one must really see a detail distinctly before it can be drawn, and this causes much to be noted which might otherwise be overlooked. For this reason sketch-book notes are of educational value to the photographer, who sometimes falls into the habit of simply studying the general aspect of a prospective subject, knowing that the lens will record all the detail. The result of such carelessness is not infrequently brought home when the print is made and distracting elements claim attention which were quite unnoticed in the original at the time the exposure was made.

By way of illustrating these notes four studies are presented (selected from a much larger number) of a single group of willows located upon the margin of a small pond. "In April" (Figure 1) presents the subject before the foliage appeared, the diffused lighting quite characteristic of a mild spring afternoon lending tonal softness to the rendering. "By the Rush Fringed Bank" (Figure 2) was made in June from a standpoint considerably to the left, and lower, than the first, while "The Willow Screen" (Figure 3) shows the

trees as they appear from a point on the shore directly back of them, with a suggestion of water appearing beyond. In Figures 2 and 3 an effort was made to utilize in a decorative manner the pattern formed by the spots of foliage and spacing of the tree-trunks. The fourth study, "A Winter Afternoon" (Figure 4), shows the material from almost the same angle as the springtime study, but nearer the trees, and somewhat lower, the difference in effect between them being due to the presence of snow and greater space occupied by the trees in the winter composition.



CHARLES W. DOUTT.



A WINTER AFTERNOON

Figure 4.

*Illustrating article "On Cultivating the Habit of Observation,"
by William S. Davis. (Page 222.)*

THE MINIATURE CAMERA FOR EXHIBITION WORK

By T. W. KILMER



NE of the greatest helps to me is to know the various methods employed by photographic workers in making and printing their entries for exhibition work.

Take the last American Salon at Pittsburgh as an example: John Paul Edwards makes his work in such and such a manner, Porterfield does so and so, Louis Fleckinstein works this way. They all have their peculiar methods of procedure to produce the finished result.

Many use the 8 x 10 and the 11 x 14 camera, many pictorialists employ smaller instruments. Personally the small camera appeals to me from the standpoint of weight. I use for most of all my exhibition work (out door work) a small Icarette film camera, taking films $2\frac{1}{4}$ inches square. As I am called here and there in my professional duties, the little Icarette is always with me. Sometimes I use a K₃ filter, but mostly not. I get my clouds by stopping down. The lens is an anastigmat of F7. It is my aim to produce on the film a sharp, clear picture of what I see. This small, sharp negative is then enlarged, either in its entirety or portions of it, upon a smooth semi-matt paper. Personally I use Artura extra heavy. I enlarge always up to 8 x 10.

These 8 x 10 prints are worked up as follows: Take a drop or two of megilp, add to it five or six drops of turpentine, place a piece of cloth over your finger and mix these together. Have two tubes of water color, one of ivory black and the other of white. To fix up a bald-headed sky—touch the cloth (after mixing the megilp and turpentine) to a little ivory black, rub smooth on the bottom of a white dish or glass plate, and then rub over the entire sky with your finger covered by the cloth. After this has set, say for five or ten minutes, fold a clean piece of cloth over your finger and rub out places on the sky, representing clouds, blend



Illustrating article "The Miniature Camera for Exhibition Work," by T. W. Kilmer.

these together. By a little practice all types of skies may be put in. Shadows in the landscape may be accentuated by use of the ivory black.

In the same way planes of the picture may be separated by using the white for the distance. By using black or white on a small stump you can modify your original print in many ways to improve its pictorial value. When the 8 x 10 print is worked up to suit you, place it on an easel and copy it with a soft focus lens up to any size negative you wish. Personally I use an 11 x 14 commercial film and a Verito lens. With the finished large negative you may print in any medium you wish. My exhibition prints of late have all been multiple gums.

By the use of the small camera we may make many exposures at small expense. Let me finish by saying that the greatest help to me is in placing every film I make in the enlarging lantern and studying its pictorial possibilities when viewing it many times enlarged upon the screen.



E. J. BROWN.



Illustrating article "The Miniature Camera for Exhibition Work," by T. W. Kilmer. (Page 228.)

WRITING FOR PHOTOGRAPHIC MAGAZINES

By FREDERICK C. DAVIS



ANY one who is a practical amateur or professional photographer is eligible to write for photographic magazines. These various publications are constant buyers of articles which are of interest to photographers; and while their rates of payment are not as high as could be wished, the remuneration is satisfactory. No great literary ability nor extensive photographic experience is necessary in order to write something acceptable for these magazines, but the article must be practical and helpful. The writer must have had photographic experience, be it as a vocation, as an avocation, or as a hobby.

Needless to say, general encyclopædic recasts—such as “How Photography was Discovered”—are not wanted; nor are dissertations on the relative beauties of photographs and oil-paintings; nor any material whatever rewritten from reference books. Articles instructing how to make new apparatus, how to adapt old photographic appliances to new uses, how to save money when making photographs, how to obtain new effects, how to do any practical thing useful to the photographer—such as that is what is wanted. The editors of these magazines like live and interesting informative articles by persons who know from experience whereof they write.

Three years of experience in writing for photographic magazines has taught me one vital thing: if you are interested in the practical phases of photography, write practical articles, and not essays on pictorial composition; and if you are artistically inclined to accept photography as a new means of pictorial expression, write articles that consider the art of photography, and not any telling how to make enlarging-cameras or ruby-lamps. (These two subjects, by the way, have been over-worked.) William S. Davis, who is one of the most frequent contributors to photographic magazines, is by profession an



WHENCE AND WHITHER.

Louis J. Steele.

artist, so he logically writes articles from a pictorial standpoint; whereas I, having done commercial and illustrative and press work, write wholly from the practical angle. It is necessary to write of the things on your own side of the fence.

Following is a list of prominent photographic publications, with the needs of each outlined, with a list of typical titles from some, and with perhaps a word or two here and there of personal observation. Certain magazines such as Abel's Photographic Weekly (Cleveland) and the Bulletin of Photography (Philadelphia) use articles of interest to professional photographers only.

American Photography, 428 Newbury Street, Boston, Mass. Frank R. Fraprie, Editor, Arthur Hammond, Associate Editor. Monthly. This magazine uses articles treating almost every phase of photography. Its needs, like those of other photographic magazines, are so general in its line that it seems no one sort of practical article is more favored than another. It is desirable, though, that articles on ordinary photographic subjects be not too long; also that the subject be covered thoroughly, and not too argumentatively. Not more than three or four illustrations should accompany any one article. These restrictions I have found in personal experience. Matter accepted for publication is paid for on publication at the rate of \$3.00 per printed page, which averages about one-half cent per word.

A list of representative titles of articles showing the sort of matter this magazine prints:

Enlarging on Gaslight Paper.	Making an Enlarging Apparatus.
Photographing in the Home.	
Finishing Efficiency.	Photographing Interiors.
Angle of View and Wide Angle Lenses.	Far Eastern Art and its lessons.
Photographing Athletic Events.	Notes on Marketing Prints.
Tropical Photography.	

The Camera, 636 Franklin Square, Philadelphia, Penna. Frank R. Chambers, Editor. Monthly. This magazine prefers articles telling how to make things. Literary efforts that get nowhere are at a discount. Articles of interest to practical workers are preferred to be of about 1,000 words long. "Reports in two or three weeks." Pays on acceptance at about one-half cent per word or slightly higher.

Representative titles from The Camera:	Management of Lines in Com- position.
Use and Abuse of the Soft Focus Lens.	Control in Development.
Improving the Printing Qual- ity of Negatives.	Figures in the Landscape. Correct Exposure.

Camera Craft: Claus Spreckels Building, San Francisco, California. Monthly. This publication does not pay for unsolicited manuscripts. A great many able writers and ardent photographers feel willing to give, without pay, the benefit of their experience and ability to fellow enthusiasts. These have generally filled the pages, apparently with satisfaction to Editor and Reader. Contributions are always welcomed and, meeting standards and policy, are published.

Photo-Era Magazine: Publication-office, Wolfeboro, New Hampshire; Boston office, 367 Boylston Street, Boston 17, Mass. Wilfred A. French, Ph.D., Managing Editor; A. H. Beardsley, Associate Editor and Publisher. Monthly. This publication uses articles on photographic subjects that are scientific, practical or that describe interesting parts of the world for the tourist-photographer to visit. Articles are solicited from practical photographers only. Manuscripts are reported on within two weeks and payment is made upon acceptance, at the rate of \$3.75 per printed page. The smaller type used in printing *Photo-Era Magazine* compensates for the seemingly higher rate. The rate is really about one-half a cent per word, the same as other photographic magazines pay. A few representative titles of articles printed in *Photo-Era Magazine* are:

Balance by Shadow in Pictorial Composition.	
Photographic Greeting Cards.	The Cheapest Printing Pro- cess.
Mounting Prints.	
Push-the-button Retouching.	The Big Question—Exposure.
The Quartz-Meniscus Lens.	Repairing Broken Negatives.
How to know your best photo- graphs.	Insects in Comic Photography.
The Enemy—Dust.	The Camera in The Wind- ward Islands.
Cob-web Photography.	Selling Your Photographs.

Photo-Miniature, 103 Park Avenue, New York, John A. Tennant, Editor. Monthly. This is a series of monographs



FOREST RANGERS IN CALIFORNIA.

OSCAR MAURER.

on photography issued in the form of a monthly magazine. Each issue contains a monograph, dealing exhaustively with some one photographic subject, of from 10,000 to 15,000 words. Before submitting manuscript for this publication, write to the editor asking whether the subject is acceptable, and be sure that your information is cast in the form usually shown in its pages. Manuscripts are reported on in ten days. A clear, concise, and practical survey of the subject is indispensable in monographs intended for this publication. \$50.00 is paid on acceptance for suitable monographs.

Kodakery: Eastman Kodak Company, Rochester, New York. Monthly. Articles for *Kodakery* must be written for the amateur, and should not exceed 1,000 words. This magazine is small, and is mailed free-of-charge to anyone who purchases an Eastman camera made for amateurs. It is maintained as an advertisement, which fact should be a valuable hint to the writer. Manuscripts are reported on in one week and payment is made on acceptance at a rate fixed accordingly with the value of the contribution.

It is evident that the foregoing magazines do not use small photographic items of a hundred words or so. However, *Popular Mechanics* (Chicago) in its Shop Notes and Amateur Mechanics' department uses many original and novel items of about one hundred words, paying on acceptance rates varying from \$1.00 to \$7.50 and even more for acceptable material, depending on the value of the contribution. The average price is about \$3.00.

Illustrated World (Chicago) buys the same sort of material, paying on acceptance at rates varying between \$1.00 and \$2.00 for each item. Address the Handy Mechanics Department.

Popular Science (New York) is usually overstocked with photographic articles, but when they buy they pay from \$1.00 up for each, the average being \$2.50 for items illustrated with photographs. Address such articles to the Practical Workers Department.

Other magazines which occasionally use photographic articles are *Browning's Magazine* (New York), *International Studio* (New York), some art-magazines, as well as various home-publications which now and then use articles telling how to make better photographs.



COAST NEAR MONTEREY, CALIF.

F. WILLIAM CARTER.



Figure 3.

*Illustrating article "Photographing Oriental Art Bits and Bric-a-brac,"
by Dr. R. W. Shufeldt.*

PHOTOGRAPHING ORIENTAL ART BITS AND BRIC-A-BRAC

By R. W. SHUFELDT, M. D.



ALL of the objects to be described in the present article form a part of my private collection. They came from various sources, and some of them have been in my possession for over fifty years. One day I conceived the idea of photographing the pieces here reproduced; and as the photography of such bric-a-brac draws a bit on one's taste and skill, it occurred to me that an account of my success in this matter might be of interest to the readers of the *Annual*, especially if accompanied by an historical sketch of the material, as well as a short description of each piece.

In Figure 1 we have a most interesting object that came from China—I think from the city of Shanghai—and is probably the work of a native; it has been in my possession since about 1865, so its exact history has, to some extent, faded



Figure 2.

Illustrating article "Photographing Oriental Art Bits and Bric-a-brac,"
by Dr. R. W. Shufeldt.

from my memory. Whoever the artisan may have been, he evidently intended to produce a piece worth the while, for it is no less than fourteen inches in height, carved out entirely of one piece of some hard wood. Whether it represents a Buddha, or some Chinese lady of rank, or other female personage, I am unable to say. Some student and expert in this line of Oriental art can best pass upon that point. That it is intended to represent Buddha, I doubt very much. The face, hands, and feet have been painted a deep red color, while all the drapery is heavily overlaid with gilt and that to a very considerable thickness. This has kept wonderfully well when we consider the age of this piece and the traveling it has done. As will be observed, the pose is a seated one, but not a conventional Buddha attitude, for the right leg is raised, and it is only the left that is in contact with the seat for its entire outer side. In the left hand is held a black roll of what appears to be some document or other, as its ends are painted to represent the rolling. As will be seen in the photograph, the seat, whatever it may be intended to represent, is a lofty and most elaborate affair, curiously carved and painted in a deep black, with a few blotches here and there of a bright green, especially near the base. Two ledges have been formed by the carver at the back of this seat—one on the right hand side to hold a green vase from which a flame seems to be issuing, while the other is a rest for a white bird—possibly a cockatoo.

To make an effective picture of a figure of this sort, it demands to be photographed directly from in front, as it is from this point alone that this ancient and attractive piece can be appreciated. On direct lateral view there are but two points best seen, and these are the profile of the person, and the fact that the elaborate top of her seat or throne arches far over her head, its outermost point being in about the same plane with one an inch in advance of her left knee. The back of this piece is flat and uncarved.

A very remarkable piece of pottery of Japanese manufacture is shown in Figure 2, it being a "chocolate-pot," and was probably made for the export trade. The spout, lid, and upper half of the handle of this vessel is glazed, and of a mottled sap green color, the rest being dull and unglazed and



Figure 1.

*Illustrating article "Photographing Oriental Art Bits and Bric-a-brac,"
by Dr. R. W. Shufeldt.*

of a dark Prussian green, marked all over with Japanese characters, as though done with a blunt pinpoint. About an inch above the bottom there is a small, raised, white slab of china, pointed above and rounded below, upon which a hair-line character is traced, which may be the trade-mark of the maker. On the outer left-hand side of this pot are two figures of men in alto-relievo, probably engaged in playing some game or other; they stand on ledges raised above the outer surface of the vessel, evidently placed there for their especial accommodation. The opposite side is plain; hence, in photographing such an object, it should be turned so that the spout and handle show up well, to let us see as much as possible of the two figures that lend such a remarkable interest to the piece as a whole.

The beautiful little teapot shown in Figure 3 is of Chinese make, of a pale green color, and a piece of "trick china"; it holds about two small cups of tea; and when a stranger is served, he or she is very apt to wonder how it was filled, as it has no lid, and no opening at the top, while the spout is very small. To let the secret out, I may say that the opening is in the bottom and stoppered with a very small cork. The Chinese think this is very cute and a great joke!

The block seen in the same figure with the teapot is of wood, two and a half by one and a half inches in size, and one inch thick. Upon it are two raised Chinese characters. This was my father's personal card-plate for his visiting cards in China, when he commanded one of our warships in the Asiatic station. It was left to the taste of the owner as to what color ink to use and what kind of paper, and there were places in Shanghai where the printing was done and the "cards" ordered.



Figure 1. Comparison of Structure From Different Regions of a Copper Alloy (Microscopic).

Illustrating article "Photography in Research and Science," by Arthur G. Eldridge.

PHOTOGRAPHY IN RESEARCH AND SCIENCE

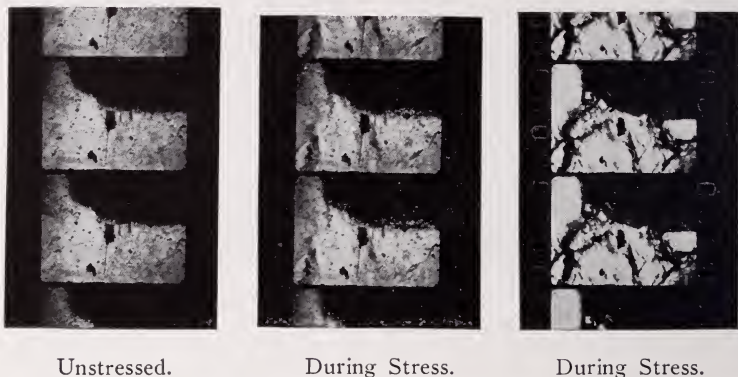
By ARTHUR G. ELDRIDGE

WITHIN the past few years there has been an increasing use of photography in research work and in science for industrial purposes as well as educational. The still camera and the motion camera combined with the microscope are far reaching in their application, giving us indisputable evidence, and making records superior to any possible description or other methods of recording.

In the field of metallurgy there has been great advancement in recent years in the knowledge of metals and in improved products, much of which is due to Microscope Photography. This makes it possible to record the results so that a comparative study may be made (Figure 1). A properly prepared specimen placed under stress in a special stressing machine may be photographed in motion through the microscope, showing the action of the crystals, the failure and breakdown of the metal under excessive load (Figure 2).

This work has led to investigation on a large scale of the fatigue and failure of various kinds of steel for important

uses. The metallurgist in studying the heat treatment of metals makes photomicrographs of the results in a long series of specimens, revealing the effects of the treatment on the structure and composition which can not be indicated by chemical analysis.



Unstressed. During Stress. During Stress.
Figure 2. Progressive Stages in the Failure of Wrought Iron Under Repeated Bending Stress.

In biology the functioning of organs, the movements of corpuscles in arteries and veins and their reactions to parasitic organisms may be shown clearly by motion pictures (Figure 3). Studies of the effect of rotation on the semicircular canals of animals and nystagmus of the eye in humans have

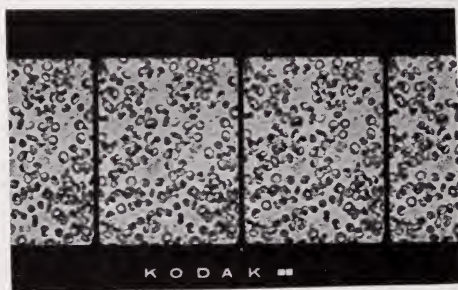
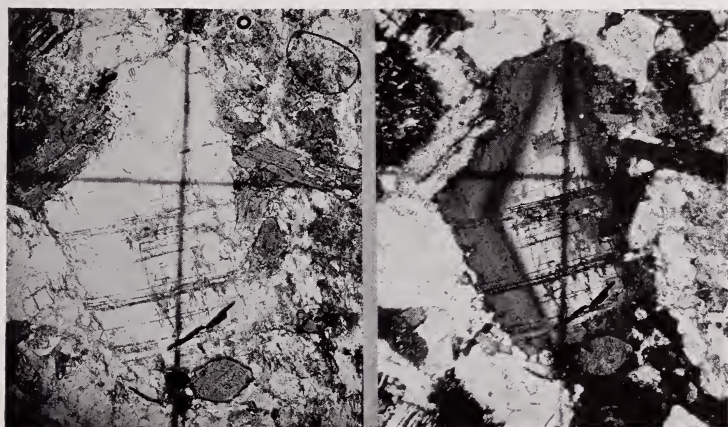


Figure 3. Corpuscles in Motion Showing Their Form and Change of Shape as They Pass Through the Capillaries.

proven to be of value. By reducing or increasing the nominal speed of taking we may see things hidden from the unaided eye.

We may pass beyond the range of visibility to the ultra violet region and record photographically some things we would never see because within the range of visible light certain substances do not differentiate from their surroundings.

Slow motion pictures of athletic performances are of great value for instructional purposes in athletic coaching. It takes one a long time to find out by eye what happens in the quicker motions of discus throw, ball pitching or tennis. Film a perfect performance once and it may be repeated indefinitely without losing "form."



Ordinary Light.

Polarized Light.

Figure 4. Structure in Rock Section Revealed by Polarized Light.
Identical Area in Each Photograph. (Microscopic.)

In the field of geology, industrial development of mineral deposits may hinge on what the microscope reveals. The camera will record what the scientist sees for the illustration of his report. A case in hand gave proof of the presence of certain minerals when photographed in polarized light, while other methods of determination had given a negative answer. (Figure 4).

From these few illustrations we can see that photography is a potent tool of science, recording where nothing else can record; giving in a flash a faithful reproduction of intricate structure where hours of labor at drawing could not interpret; telling quickly the facts where chemical analysis or physical examination would fail.

MORE ABOUT PHOTOGRAPHIC LENSES

By CARL W. ATKINSON



IN response to the request of the Editor, the writer will attempt to follow up the article "Photographic Lenses, Types and Uses" in last year's *Annual*, taking up some of the subjects in more detail.

In that article we traced the progress of photographic optics from the beginning through the various stages; the single achromatic lens, the rectilinear, the Petzval, and lastly, we briefly mentioned a few of the modern types of anastigmat lenses. In this number, we shall briefly review a part of last year's sketch, especially that part referring to the various aberrations, and go into a bit more detail in the discussion of types of anastigmats.

The six aberrations we mentioned were (1) Chromatic aberration; (2) Central Spherical aberration; (3) Distortion; (4) Symmetrical Spherical aberration of oblique pencils (astigmatism); (6) Curvature of field. Other aberrations exist but they only appear in objectives of exceedingly large diameter.

Chromatic aberration, though the first fault to be corrected (chronologically speaking) is still extremely troublesome owing to the fact that glass does not disperse all parts of the spectrum equally, and it is quite impossible to correct any lens for all colors. The ordinary photographic lens of short or medium focal length is quite well enough corrected for any reasonable purpose, but in the huge telescope this variation of the foci of various colors may be a matter of inches and prove very troublesome indeed—particularly when it is desired to photograph with them.

In microscope objectives it is possible to use fluor spar and obtain almost complete elimination of this troublesome error, but perfect pieces of fluor spar are never found of size sufficient for use in photographic lenses, so that recourse must be had (when especially fine color correction is imperative) to



JOY.

Hand Coated Platinum on Japanese Vellum.

MYERS R. JONES.

a variety of glass which contains calcium fluoride. This glass possesses to some degree the dispersive peculiarities of fluor spar, but is not nearly so effective.

Spherical aberration of direct pencils can be corrected so completely that in the paraxial zone (or even an angle of perhaps ten or even fifteen degrees) the image will bear enlargement until diffraction breaks it down, i. e. "The standard of definition is equal to the theoretical diffraction image." This standard of definition can be more easily obtained if larger angles than those named are not demanded, but in many of the modern lenses not only an angle of sixty degrees or more must be covered, but also they are required to work at relative apertures far greater than were deemed practicable in former years.

This condition frequently makes necessary the sacrifice of some of the fine central definition in order to obtain fair marginal correction; some modern anastigmats lack much of the fine central quality of a rectilinear by the best makers. Some ultra rapid anastigmats do not give images of really critical sharpness and will shift focus when stopped down, making it really necessary to focus with the stop to be used in making the exposure; this is caused by the fact that perfect correction for central spherical aberration (of direct pencils) has been sacrificed to attain marginal definition, speed or both.

Distortion was fully covered in the 1921 *Annual*, so that no further mention need be made of it here.

Astigmatism and coma have long been the *bete noir* of good lenses, and they are most difficult to explain because no drawing can be made to properly illustrate them.

Paul L. Anderson in his book "Pictorial Photography" gives perhaps the best definition and illustration of astigmatism in print today. We quote:

"Astigmatism is that defect in which bundles of rays passing obliquely through the lens near the margin are converged, not to points, but to straight lines. Each such bundle is converged to two straight lines at different distances from the lens and at right angles to each other, or, rather, it is converged to a line, and after passing the point of convergence it diverges again to another line. Astigmatism is difficult to illustrate graphically, but may be understood by anyone who will



AN OLD FASHIONED GIRL.

William Alexander Alcock.

roll up a truncated cone of paper and pinch the small end to a straight line, afterward pinching the cone to another straight line at right angles to the first and at some distance from the end. The straight lines represent the projection of a point of the object, whereas if the lens were free from astigmatism this projection would be represented by rolling the paper so as to form a complete cone, the small end being a true point. It should be noted that astigmatism appears only at the margins of the field, so will not be noticeable if the lens is of great focal length relatively to the plate used. The practical result of astigmatism is to render it impossible to focus simultaneously on vertical and horizontal lines in the same plane and lying near the edges of the field, so that if the image of a tree, for instance, comes close to the edge of the plate the trunk will be sharp and the branches blurred, or vice versa, but it will not be possible to get both sharp at once, except by using a small diaphragm."

Coma is an unsymmetrical error which increases greatly as the lens diameter grows larger in proportion to the focal length; it therefore is the arch enemy of rapid lenses. A certain amount of it can be camouflaged by scattering it over the entire field; this is frequently done, and the only way it is noticeable is that the resulting negatives are grey and hazy in appearance—they lack "sparkle" or "snap."

It is possible to correct a single element for coma, and the well-known Cooke and Heliar lenses were designed to eliminate the error by this means; each of the three elements is free from coma. Other lenses have been constructed which are remarkably free from this error. Dr. Rudolph practically eliminated it in his original design of the F/6.3 Tessar, while several of the most famous of modern designers have made great strides toward absolute correction of it.

Complete correction of curvature of field is at present, and will be, impossible as long as opticians are compelled to use spherical curves as lens surfaces. No way has ever yet been devised for the successful grinding of ellipsoidal surfaces with the accuracy necessary for photographic objectives.

The development of aeroplane photography has caused great steps to be taken in overcoming curvatures, since absolute flatness of field over an angle of about forty-five degrees is an

essential to successful work of this character and too, it must be obtained in very large aperture lenses. Some of the very newest lenses of this type are wonderfully well corrected.

The term "Anastigmat" may be truthfully applied to any objective in which is attained good correction for astigmatism, central spherical aberration and curvature. Good correction for chromatic error is assumed and usually attained. The best optical firms produce lenses of this type which are not only well corrected for these errors, but are also very free from other and equally serious defects.

A very excellent type of anastigmatic objective may well be termed the "Protar type" since the Protar by Carl Zeiss was the first objective of that design, and is still one of the very finest of the various convertible anastigmats.

Each element of the "Protar type" is composed of four elements cemented together to form a very perfect single lens which is in itself a complete anastigmat working at $F/12.5$. The doublet is, of course, equally excellent in its performance, works at from $F/6.3$ to $F/7.7$, and at small apertures, covers about 85° degrees. The outstanding feature of this type is the readiness with which different singlets may be combined to obtain doublets of different focal length; a set of three or four of the single elements making possible a selection of six or ten focal lengths.

Several lenses of the "Protar type" are made today, each having its individual claims for superiority, and the writer is glad to remark that nearly all of them are of high excellence. The only real disadvantage of the construction lies in the fact that, owing to the deep curves and numerous elements, it is very costly to produce.

Another type of lens which was and is deservedly popular has three cemented elements in each half. The complete lens gives an excellent image over (at small stops) about ninety degrees; its usual aperture is about $F/6.8$, and it can be relied upon to do excellent work under any conditions when its speed is sufficient.

As compared with the preceding type, the latter has a somewhat wider angle, but not quite so flat a field; the cost is less but it is much less readily combined in sets and the singlets do



GILMER WINSTON.

not perform as perfectly unless stopped down to (in most cases) $F/16$.

Many lenses of the triple cemented type are produced, and those by the really reliable makers are of high excellence.

Another type of lens is composed of two symmetrical elements, each of which consists of two cemented meniscus elements whose concave surfaces face the diaphragm. It usually has a very flat field of about 65 degrees, within which angle the definition is extremely critical at an aperture of about $F/6.3$. At small stops this angle is somewhat increased. It costs somewhat less to produce than many types, and slight variations of glass are easily compensated by varying the separation of the elements.

A rather unique type of lens we will term the "Cooke type," since the Cooke lens is the most prominent example of it. It is composed of three single elements which are separated by air spaces; the front and rear element are double convex, while the central lens is a double concave, more powerful than either of the positives. Each element is free from coma in itself, and the curves and separations are so designed as to give very fine correction for the other errors. The image is, therefore, very sharp and, by reason of its perfect coma correction, very brilliant.

Several modifications of the original design have appeared, giving lenses which are intended for different purposes.

One of the most successful and widely modified lens designs (among unsymmetrical lenses) is that of the "Tessar type." It is composed of two uncemented elements in the front combination and two cemented behind the diaphragm. It was originally designed to work at $F/6.3$ to cover an angle of about 65 degrees. Within these limitations of speed and angle, it is almost unsurpassable.

It has been widely copied and modified with more or less success, the first modification having been made by the original designer. This was an $F/4.5$ Tessar, which at the time of its introductions was easily the best $F/4.5$ anastigmat on the market, inasmuch as its image showed fewer optical errors than any of its predecessors. It is still in a class with the very finest of ultra rapid objectives—a class which is above criticism and no one of which, perhaps, is superior in every

way to the others. Most of these, too, are of the Tessar type.

This article would scarcely be complete without a brief description of telephoto lenses, which have been developed greatly within the past decade.

Telephotography has long been practiced and deserves greater popularity not only on account of its possibilities in the way of obtaining large images of distant objects, but also on account of the very perfect perspective obtained by its use.

The forerunner of the telephoto lens was called the "Orthoscopic Lens," and consisted of a positive front combination with a negative rear. It gave a long focal length with a short bellows extension (as do all telephoto lenses) and was, for a time, very popular. It proved, however, not to be orthoscopic, as it gave marked distortion, and soon disappeared from the market.

J. H. Dallmeyer experimented for a long time with a lens similar to the "Orthoscopic," except that varying sizes of image were made possible by altering the separations of the positive and negative elements, thus altering the focal length. Failing to eliminate serious distortion he gave up this design in favor of a fully (centrally) corrected positive lens, and a negative element constructed as a doublet similar to a rectilinear. This largely obviated distortion at the expense of at least doubling the number of glass-to-air surfaces in the complete combination.

For several years Dallmeyer's plan was used by the various opticians except for the fact that they made a cemented singlet negative, instead of a symmetrical doublet. For architectural work these lenses are most excellent, since the positive element may well be one of the cemented triplet or of the Protar type, which can be used for medium or wide angle work, independent of the negative lens.

Such combinations are necessarily very slow, and for work demanding quick exposures one must either use very rapid positive or one of the two types to be described.

While it is not in the province of this article to give an elaborate description of telephotography, perhaps a few words of explanation may be of use: In telephotography the rays emerging from the positive element and the image thereby magnified to a degree depending on the distance between and

relative focal length of the two. It is quite evident therefore that (1) the central part only of the image formed by the positive is used (since the rest would be off the plate) and therefore the central corrections of that element must be perfect for the errors are magnified; (2) Since the image is spread over a larger area it is less powerful in its action on the plate. A positive lens working at $F/4$ gives a telephoto combination working at $F/8$ at $2X$; $F/12$ at $3X$ etc.

A few years since, several lenses appeared on the market which allowed telephoto snapshots. They were almost identical with the "Orthoscopic" in principle though far better corrected. They gave a $2X$ magnification with ordinary and negative aberrations were well balanced. They worked at speeds which varied from $F/9$ to $F/5.4$ and proved a great boon to press photography.

The call for a variable focus telephoto lens with speed caused Dallmeyer and Voightlaender to fit lenses of the Petzval type with telephoto attachments, but their great weight and bulk has been an objection.

At last Zeiss produced a cemented quadruplet which worked at $F/3$, and mounted this in an adjustable mount with a negative element. This was a distinct step in the right direction, and it was perfect enough that some of these lenses are still in use. It made possible a snapshot outfit of reasonable bulk, which could be used to photograph subjects theretofore impossible.

There are several lenses of this type on the American market today which are very successful. They are light enough to work on a reflecting camera, and so well corrected as to do fine work at their full aperture, which is quite rapid enough for anything except the highest speed work.

In conclusion may the writer venture to state that were he selecting an outfit for "all around work" he would choose a "set" of lenses of the Protar type or a cemented triplet type lens. For hand camera work one of the $F/6.3$ Tessar type would prove exquisite. For speed work there is a wide range of ultra rapid objectives to choose from, and they vary widely in their characteristics as applied to the different requirements of the photographer.



SOLITUDE.

G. H. S. HARDING.

PHOTOGRAPHY IN BIOLOGICAL WORK

By B. F. LUTMAN



THE following notes make no claim whatever to originality of method used; they have been gathered from various sources, and many of them are well known to biologists who make use of the camera for recording some of their observations. At the present time almost every botanist and zoologist uses the camera at some time or other for such a purpose since it offers such a quick and convincing means for recording evidence. The methods here suggested, however, are ones that have been tested out and found successful in quite a number of years of experience with botany and photography, and while they are fragmentary and unconnected, they may at least serve to call attention to some materials or procedures that are not as widely known as they might be. The author frankly recommends certain products—not because they are necessarily the only ones or maybe even the best—but for the reason that they have given results with him in the particular work for which he wished to use them.

Lenses. A lens, good, bad, or indifferent, some one has said, is worth just about what you paid for it. A high priced lens for photographic work like a good microscope objective means good workmanship, and is backed by the advertising, and by the reputation of a reliable firm. There is, however, one factor that adds greatly to the price of many of the lenses known as anastigmats. This is what is known as speed. The aim of the modern lens maker is to produce a lens that will work at very short exposures in poor light, or will catch rapidly moving objects in good light. This means that the lens has a large aperture, and large aperture lenses do not have depth of focus; it is optically impossible to have both at the same time.

But the biologist does not need speed one time in a thousand. So, unless the laboratory lens is to be used surreptitiously for pictures of the baby at home, or of auto races,



AN OLD FARM HOUSE.

C. E. Wakeford.

its wide aperture and resultant speed is useless. A rectilinear will, in most cases, do just as well as a high priced anastigmat since they will both have to be stopped down to a small aperture to secure depth of focus, and at these small openings the results obtained could not be distinguished even by an expert. A lens of the speed known as F/6.8 will answer all requirements. Fine definition and a brilliant image are the real measure of a lens for scientific purposes. The author is strongly prejudiced in favor of the cemented type of lens, and has used a Voigtlander Collinear Series III and a B. & L. Plastigmat for years with better success than with the air space lenses. Nearly all, if not all, of the cheap anastigmats are of the latter construction. The advantage of the cemented lenses is that they work against the sunlight without flare and give a brilliant image. A lens of as short a focal length as possible is of advantage in giving depth of focus. A seven or seven and a half inch lens on a 5 x 7 plate or a five or five and a half inch on a 4 x 5 plate, would be my recommendation.

Shutter. Reliability is the test of a shutter for scientific work. Speed, as with lenses, is not essential. The Compound, Volute, or Optimo shutters answer all requirements, but my choice would be a Volute since it gives timed exposures up to three seconds.

Camera. The majority of scientific men have settled on the 5 x 7 camera as the proper size for indoor, or for not too extensive field work. Its advantages are in the medium price of the plates, the camera is not too large to carry, and in the size being just right for the page of the ordinary average book or bulletin. Two points are to be considered in buying a camera: a rigid front for the shutter and lens and a long bellows. The bellows should be at least sixteen inches long.

In addition to the 5 x 7 camera, which, with its case and six loaded plate holders will weigh ten or twelve pounds, a smaller pocket camera that can be taken on field trips and excursions is advisable, and is the instrument that will be used nine times out of ten for work outside the laboratory. A roll film camera $2\frac{1}{4} \times 3\frac{1}{4}$ is the best choice for this sort of work; it is convenient; it is small enough to go into the

pocket; the films can be obtained anywhere; the pictures are large enough for contact prints and as large as can be made into lantern slides by contact. For real work such a camera should have tripod sockets and some means for focusing.

Second hand apparatus. When funds, either laboratory or personal, are scarce, second-hand lenses and cameras may be had that have lost little except the newness of the leather, or the brightness of the nickel trimmings together with about a third of the original price. Of course, if money is no consideration, it is as well to buy new equipment, but a little shopping among the reliable second-hand dealers will often bring up just the sort of an instrument that you want. There are a number of such firms now where the purchaser can be assured of fair treatment.

Photographing colored objects. The average biological worker falls back on ortho or isochromatic plates for bringing out differences in the intensities of greens and yellows in plants or animals. These plates will answer most needs, as they are sensitive to these two colors when used with a yellow or orange filter of proper density. The photography of colored flowers presents a lot of new problems, however, as does the proper rendering of the various shades produced in plant diseases. In some cases a panchromatic plate is absolutely essential for success. The Eastman Kodak Co. have a pamphlet on "Color plates and filters for commercial photography" that may be had without cost, and Dr. C. E. K. Mees, the scientific director of the company, has written a small and very understandable book "The Photography of Colored objects" that is invaluable to any one interested in getting proper color renderings in plants, or in any other object for that matter. The latter book sells for about fifty cents and is obtainable from any dealer. The Wratten Panchromatic plate and the Wratten filters, also Eastman Commercial Panchromatic film are made by the Eastman Company. They will do the work as well as anything on the market at the present time since they are sensitive to all of the colors, even red, but must be used with the proper light filter.

Photographing stained sections or stained objects. It is often difficult to get sufficient contrast from stained sections with the ordinary plates even those that claim to be iso- or



GILL & SON.

orthochromatic. The writer has even fallen back on process plates since they gave more contrast. Blue or purple stains are always the hardest to handle, and these tones are very common in sections stained with the so-called triple stain. The Eastman Company makes a plate for this special purpose known as the Wratten M. This plate is panchromatic, and so must be developed either in darkness or with a green safe light. It is backed, a great advantage in getting a brilliant negative. The emulsion is a slow one but as rich in silver as a process plate. No special difficulty is experienced from the development in the dark as a few trial exposures will usually give the right time. Or a special screen for the dark-room light may be obtained from the same company. The proper light filter must be used for the dye with which the sections are stained. The Eastman Company have a booklet on the subject "Photomicrography" which may be had for the asking. The absorption bands of the various stains, and the effect of the proper light filter on the time of exposure, have all been worked out and are presented in tabular form. My method for introducing the light filter may be new. For low magnifications, a B. & L. or Spencer Lens daylight lamp is placed under the microscope substage, the daylight glass being removed and a piece of white frosted glass substituted. The mirror is useless and must be first removed from the instrument. The light from these lamps is sufficient for medium magnifications. The Wratten filters (two inches square) are bound up between two plates of glass (lantern slide covers) and placed on the lamp. The light which reaches the stained object is colored. The advantage of this method is that the light filter if placed at any other point may cause optical troubles especially after it has been enclosed between glass. It is necessary to enclose these filters in this manner, or to buy them enclosed, as they are only stained pieces of gelatin and are readily soiled by the fingers.

Cut Films. Some years ago, it was possible to obtain several makes of cut films which could be slipped into special holders and then loaded into the ordinary dark slide. They had two great advantages over the glass plates in that they were non-breakable, of light weight, and small bulk when stored. It has been estimated that they have one tenth the

weight of dry plates and occupy one sixth the amount of storage space. Scientific negatives, especially those taken in the field, have often to be sent by mail to be developed, and the non-breakable quality is appreciated if the views are highly important ones that may be almost impossible to obtain a second time.

The cut films went out of fashion for a number of years, but the Eastman Company has recently taken them up in this country, and is pushing them under the slogan, "Cut films will replace glass dry plates as the dry plates replaced the old wet plates." The Portrait film put out by this company was the only type obtainable for several years but today, the same company puts out Commercial, Commercial Ortho, and Process films, all at the same price and Panchromatic films at a slightly higher price. The Commercial Ortho is especially fine for biological work where small differences in color is to be represented, but for most work the Portrait film is entirely satisfactory. The superiority of the Commercial Ortho comes out when the subtle differences between the plants that have been treated with different types of fertilizers is attempted in a photographic manner. The shades of green, green-yellow, and bluish green are perfectly clear to the eye, but are exasperatingly elusive on a photographic plate. The Portrait films can usually be obtained from dealers in fair sized towns, but only in the size purchased by the commercial portrait photographer, i. e., the 5 x 7. The price of cut-films, it may be said, is about the same as for first class glass plates of the same type.

Stereophotography. Ten or fifteen years ago, the stereo photograph was often the only object of art in many homes. The movies have killed off popular interest in double pictures, but they still have a place in scientific work. The immense advantage that stereographs have over the ordinary single print is that they give objects in all their three dimensions while the latter at its best only gives two dimensions, length and breadth, and suggests a third dimension by the distribution of light and shade. The medical profession and the animal anatomists have recognized the advantage of stereographs for dissections to show the structure of the body as laid open by the scalpel and scissors. They have been used

also to give a life-representation of certain diseases; one of the elaborate atlases on skin eruptions being put out with all of the illustrations in the form of double stereophotographs. There are many places in botanical work where the stereo picture is superior to the single picture, but the attention of the writer has been directed to it principally because of its applicability to plant diseases in which the whole plant, or some part of it, is distorted. Mosaic of potato foliage is one of the new potato troubles that causes a lot of worry to growers in the North, especially those who ship their tubers for seed. The peculiar crinkling of the foliage is characteristic, but can be brought out much better in a stereo print than in a single one. In fact the stereograph is almost as good as seeing the disease itself.

The American stereo cameras (Century, Premo, Conley, Korona, etc.) are plate cameras of the 5 x 7 size and can be used for any other work where a single large print is desired by removing in a few minutes the pair of lenses and the internal septum and attaching a single lens. A broad front (known as a stereo front) and broad bellows are the only differences between this form of camera and an ordinary one of the same size. A pair of rectilinear lenses of about 5 inches focus in a stereo shutter completes the outfit. The Eastman Kodak Co. puts out a stereo roll film camera which is very convenient for field work but offers the disadvantage, as do all roll film cameras, that it is impossible to focus on a ground-glass. The stereo prints are just as easy to make and mount as ordinary ones, and there is nothing complicated or mysterious about the whole process. If you have never tried stereo photography, you will be fascinated by it as a means of representing in a picture all that we see in nature except the color, and it is possible to add even this attraction if Autochrome plates are used.

Line drawings from photographs. The line drawing is often preferable to the photograph for purposes of reproduction. The only successful cheap method of reproducing a photograph is by means of a half-tone, and this type of plate only prints well on a fairly smooth paper. It prints at its best and approximates the photograph itself on a glossy, highly calendered, printing paper but such a paper is today very



IN DOCK

WARREN R. LAITY.

expensive and cannot be used for bulletins that are to be printed by tens of thousands for free distribution. A simple method of changing photographs into line drawings has been followed for years by the U. S. Department of Agriculture and is essentially as follows:

A clean, clear negative of any size, is best as it has to be used for enlargement. The negative is put into an enlarging lantern and a large print, say 8×10 or 11×13 made from it. This print must be on a paper that does not have a glossy surface; Enlarging Cyko or Artura Carbon Black work equally well. The dry print is gone over in outline with Higgin's India ink. The objects are all gone over in ink on this print, care must be used to see that everything of importance in the photograph is represented in ink. Shading is represented either by lines or cross-hatching. The print furnishes the background, shading and everything—no special artistic skill is necessary—and a little practise will soon show just what must be reproduced in the ink to make the line drawing look lifelike when the photograph has all disappeared.

The next proposition is to get rid of the photographic image entirely. This is done in a bleaching solution. Prints may be bleached in a strong solution of Farmer's reducer. This reducer is made up of potassium ferricyanide and hypo and bleaches rather slowly. A fairly strong solution of the ferricyanide should be used to hasten matters. A bleach which will work equally well and is used by many photographers is a four per cent solution of potassium cyanide to which is added a little iodine in a potassium iodide solution (10% c. c. of a $1/3\%$ of iodine in a 1% potassium iodide in water to 90cc. of the potassium cyanide solution). There seems to be no particular advantage in this combination over Farmer's reducer and the highly poisonous character of the potassium cyanide itself and even of its fumes makes extreme care necessary in handling it.

Before placing the prints into this solution for bleaching, the writer has always found it best to have them bone dry. The easiest way to do this is to lay the print for a few minutes on the steam radiator after the last ink work has been completed on it. The ink will stick tenaciously to the paper and not be dissolved in the above solution, but the print must not

be touched, and the washing which follows the bleaching (10 - 15 minutes) must be carried on in such a way that the stream of water will not strike the print directly. Do not touch the print until it is completely dry when it will be found that the ink will not be easily removable. This method will lend itself to converting photographs of any sort into line drawings. One of the most successful lot of prints ever seen by the author was a series of microphotographs of wood tissues changed to line drawings.

Lantern slides. Lantern slides are always necessary at times. Most amateur photographers have a knowledge of the ordinary bromide slide for whose manipulation a regular dark room and a red light is essential. An English slide, the Wellington S. C. P., imported by Ralph Harris and Co. of Boston, is in many ways easier to handle, and for certain purposes is much superior. It is a reflection on American dry plate makers that they have not put a similar product on the market. The mystical letters, S. C. P. mean Slow Contact Printing and indicate that the slide has an emulsion similar to that of Cyko or Velox paper, and not like that of bromide paper. No dark-room is necessary for this lantern plate development and the time of exposure is approximately the same as that of Cyko. The Cyko developer works well with it although the makers give a very different formula. This lantern plate is especially fine for line drawing copied from books, giving good, clear black lines and for contact prints from small snap-shot negatives that are of indifferent quality. It is possible to get lantern slides from any negative that will give a passable print on Cyko, Azo or Velox. It is needless to say, of course, that these slides are too slow for making lantern slides by reduction; they are only intended for contact prints.

PHOTOGRAPHING BIRDS' NESTS

By HUGO H. SCHRODER



HOTOGRAPHING birds' nests is a very fascinating branch of Nature photography and offers a great many possibilities for artistic results. When photographing birds we have to expose rather hurriedly to get our subject, but with their nests we have plenty of time to compose the view on the screen.

The camera to be used for photographing birds' nests should have a bellows extension of at least twice the focal length of the lens used. $3\frac{1}{4} \times 4\frac{1}{4}$ and 4×5 cameras are well suited for this work, as they give contact prints of good size, and good quality negatives can always be enlarged to any desired size. The $3\frac{1}{4} \times 4\frac{1}{4}$ camera is ideal for the photographer who is interested in lantern slides, as this size plate is right for making slides by contact printing. The camera should be equipped with a ground-glass screen.

A rectilinear lens of the convertible type will do very well for photographing nests and eggs, and also for photographing young birds in the nest in good light. The convertible lens is to be preferred, as it enables the photographer to use the camera at some distance from the nest where it is located on the outer branches of trees.

A tilting top tripod is needed for nests on the ground, or in low bushes. However, the ordinary tripod will do as well if equipped with a ball and socket head such as the Optipod.

The best results in photographing birds' nests are obtained on calm days when the sky is slightly overcast. A small stop and plenty of exposure is needed in order to bring out the delicate markings of the eggs, and to show the material from which the nest is constructed. When the nest is in direct sunlight it can be shaded by using the focussing cloth, or interposing the body between the light and the nest.

Always photograph nests *in situ* so as to obtain natural results. Show as much as is possible of the nest surround-

ings together with the detail of its construction. When the nest is hidden among the foliage do not trim away any branches or leaves that are necessary to shelter it from sun or rain, but tie these out of the way while making the exposure. Be sure to leave the surroundings as you found them so as to protect the nests from the elements and from observation. Nests left exposed are often destroyed by various animals and snakes. The small boy is often the cause of nests being destroyed, or deserted, by being too inquisitive, or from a desire to make an egg collection. Do not keep the birds from the nest too long as the eggs may be chilled by any unnecessary delay.

Some birds will permit the photographer to secure pictures of them while on or near the nest, and when bringing food to their young. The camera may be set up near the nest, and the exposure made from the hiding place of the photographer, by means of a thread attached to the shutter release, or an extension tube with a large bulb. A series of photographs may often be secured showing the nest with eggs, young birds in the nest, the mother bird on the nest and the parents bringing food to their babies. Such a series will give the photographer a pictorial history of the birds and their home life.



CATBIRDS' NEST IN GRAPEVINE.

HUGO H. SCHRODER.

Illustrating article "Photographing Birds' Nests," by Hugo H. Schroder.

THE SINGLE SLANT LIGHT

By GEO. D. JOPSON



THE problem that is not a problem and still is a problem with a photographer is light. A contradictory statement? Not quite! Go to a convention. Better still, go calling on brother photographers and talk light to them, and you will find that you are higher up a tree than what you were before you started, for each man has his pet hobby about light.

All will agree that in order to successfully make photographic pictures light is absolutely essential. A photograph can be made by any kind of a pure white light whether produced as a result of the rays of the sun, or by certain artificial means; but for the purpose of producing technically perfect lightings certain rules must be adhered to and followed, especially in the construction of a light for portraiture.

As we are considering a light for the professional portrait photographer I will adhere to construction of light for portraiture, groups and such photographic work that may come to the all-round portrait photographer, and will deal with daylight and the so-called "skylight."

Having had experience with top and side lights, some tops—and possibly I can say all tops—being put in at a haphazard guess, and now working with a single slant of my own designing I will say—and to make the saying emphatic will use a slang expression—I would not go back to a top and side *on a bet*. To commence with the working of a single slant is more economical. There is only one light to curtain, and its workings is simplicity in itself. In the adjusting and re-adjusting of the curtains for the purpose of obtaining special light effects there is only one-half of the labor required.

A single slant light should be installed so that the rays of light will fall at a forty-five degree angle. To obtain this desirable angle of light rays the following rule is quite a safe one to follow, and is the one I followed in installing my light.



Figure 1.
Illustrating article "The Single Slant Light," by George D. Jopson.

The light being eight feet wide, ten feet high and four feet above the floor, I measured into the studio fourteen feet from the light; then at that fourteen feet point imagined a person five feet tall. By taking five feet it equalized between a sitting and standing figure, then drew a forty-five degree angle from the top of the five-foot figure towards the light, after which the light was slanted in to meet the forty-five degree line. By that method the top of light leaned into the studio just four feet.

The glazing of the light is ribbed glass—twenty ribs to the inch. I have heard photographers condemn ribbed glass, but personally I prefer it. The light works softer—being free from the sharp wiry effects that a plain glass is apt to give. I have heard the question arise—in fact used to ask the question myself—can a group be made successfully by a single slant, the person at the extreme distance being equally as well lighted as the person near the light? I will answer by stating that I have far better success in lighting groups than I ever did have with a top and side light. To prove my argument I submit in Figure 1 a group made about Dec. 10th, 1920. To commence with I wish to say that this group is not submitted as an example of grouping for you or any photographer to emulate, nor are any of the photographs. These are just tests of the light, and if the light had been controlled for effects the pictures would be useless as a demonstration of a single slant light.

I have selected this group on account of the conditions under which it was made. It represents "The Big Brothers Class" of the Methodist Church. Time was set for the group, every one on time except two who came strolling in a full half-hour late with the usual excuses. You photographers who make groups can understand. You have all been there. Comments and explanations would be superfluous, so will say that as a few of the others had another appointment there was just seven minutes left in which to perform the work. I know that that little sawed off, hammered down fellow in the center is bad, but he is the pastor, and was wanted there with the officers on either side of him. Well! why dwell—I grouped (?) them and shot off three 8x10 plates in about five minutes. The real reason for selecting this picture to illustrate group



Figure 2.

Illustrating article "The Single Slant Light," by George D. Jopson.

work is that it was made with *light full open* with the man on the left within three feet of the light, and the man on the right sixteen feet away. No holding back locally or faking in any way, but a straight print from a straight negative—a hurriedly made group, if badly composed still evenly lighted.

Having informed you that my light is a direct north one will add that Figure 2 was posed at east end, and Figure 3 at west end of light. These two pictures were specially made with the light wide open to illustrate this article. No screens of any description were used—absolutely no effort made to control the light—just using the light as I received it without modification. If I should submit prints to illustrate this article that were made from carefully studied negatives where the light had been controlled with the curtains, and further accentuated with the use of head and side screens, the illustrations would be of little or no value. What the photographer who is contemplating a new light desires to know is—what will your light do, not what can you do with your light. When a light performs well wide open it certainly will perform better in the hands of an intelligent photographer who thoroughly understands light and shade and its proper distribution on the face or figure, which is accomplished by means of the intelligent manipulation of shades and screens.

If you are installing a new light or contemplating the installing of one, by all means make a thorough investigation of the single slant, and if you are convinced, “believe me,” you will never regret it.



Figure 3.
Illustrating article "The Single Slant Light," by George D. Jopson.

American Annual Formulary

In the following section we have gathered together a typical collection of Formulae and Tables, which will assist the photographer in his every-day work. It will be noticed that makers' formulae are omitted. These can best be obtained by direct application to the makers. The appended formulae are selected from the working methods of practical photographers.—Editor.

TRAY DEVELOPERS FOR PLATES AND PAPERS

Amidol. (W. M. Keck).—Amidol, 20 grains; sodium bisulphite (dry), 40 grains; sodium sulphite (dry), 60 grains; potassium bromide (powdered), 1 to 3 grains; water, 4 ounces. For all kinds of developing paper. Expose so that the development will be complete in twenty to thirty seconds. The tone is a blue black.

Amidol Universal Developer. (W. A. Alcock).—Water, 20 ounces; sulphite of soda (dry), $\frac{3}{4}$ ounce; Amidol, 50 grains; potassium bromide, 10 grains; citric acid, 20 to 40 grains. Splendid developer for papers intended for bromoil. Expose so that the image first shows in thirty seconds and develop for four minutes. Gives good tones in hot or cold hypo alum, and nice soft negatives. Splendid in hot weather as minimizes danger of frilling owing to lack of carbonate.

Diamidophenol. For Paper (Edwin Loker).—Water, 20 ounces; sodium sulphite (anhydrous), $1\frac{1}{2}$ ounces; sodium bisulphite, 10 drams; bromide potassium, 10 grains. To use, take 2 ounces and add 6 grains diamidophenol.

Ferrous Oxalate. For Papers (M. G. Lovelace).—No. 1. Hot water, 1000 CC. Dissolve ferrous sulphate, 250 grams; add slowly sulphuric acid, 3 CC. No. 2. Potassium oxalate (neutral), 250 grams; potassium bromide, 1 gram; hot water to make 1000 CC. Add 1 part of No. 1 to 4 parts of No. 2. After development wash in acetic acid stop bath.

Hydroquinone. (Max Gartner).—Solution No. 1. Water, distilled, 20 ounces; hydroquinone, 160 grains; sodium sulphite (anhydrous), 2 ounces citric acid, 60 grains; potassium bromide, 40 grains. Solution No. 2, water, distilled, 20 ounces; caustic soda (sticks), 160 grains. For use take No. 1 one part, No. 2 one part, and water two parts.

Hydrochinon.—For over-exposure plates to obtain contrasty negatives (B. H. Allbee).—No. 1, water, 8 ounces; sulphite of soda (anhydrous), $\frac{1}{2}$ ounce; hydrochinon, 80 grains. No. 2, water, 8 ounces; carbonate of soda (dry), 1 ounce; potassium bromide, 40 grains. Take equal parts of No. 1 and No. 2. Temperature, 70 degrees.

Metol (H. W. Hales).—Metol, 60 grains; warm water, 16 ounces; sulphite of soda (anhydrous), $\frac{1}{2}$ ounce; carbonate of soda (dry), $\frac{1}{2}$ ounce. Dissolve metol in warm water, then add the sulphite and carbonate in order named. Cool. Can be used repeatedly. For developing papers add a few drops of 10 per cent. solution of bromide of potassium.

Metol-Hydroquinone for Orthochromatic Plates.—Water, 20 ounces; metol, 14 grains; potassium metabisulphite, 18 grains; hydroquinone, 56 grains; sulphide of soda (anhydrous), 1 ounce; carbonate of soda (dry), $1\frac{3}{4}$ ounces. Use 1 drop of a 10 per cent. potassium bromide solution to each ounce only if necessary.

Metol-Hydroquinone. For Paper (M. Gartner).—Water, distilled 32 ounces; metol, 15 grains; sulphite of soda (anhydrous) 1 ounce; hydroquinone, 60 grains; sodium carbonate (dry) 6 drams (for contrast use 1 ounce); bromide of potassium, 5 grains. Dilute this stock solution with an equal amount of water.

Developer for Commercial Work. (Max Gartner).—Water, distilled, 100 ounces; Ortol, $\frac{1}{2}$ ounce; hydroquinone, 2 ounces; sulphite of soda, anhydrous, 8 ounces; carbonate of soda, anhydrous, 12 ounces; bromide of potassium, $\frac{1}{4}$ ounce. For plates use full strength.

Para-Amidophenol. (M. G. Lovelace).—Dissolve 150 grains sulphite soda (anhydrous) in 800 CC. hot water; add 20 grains para-amidophenol; dissolve 8 grains lithium hydrate in 100 CC. water, and add until precipitate formed is dissolved; then add water to make 1000 CC.

Pyro. For Prints (M. G. Lovelace).—No. 1 Pyro, 12 grains; sulphite soda (anhydrous), 80 grains; potassium ferrocyanide, 2 grains; water, 500 CC. No. 2 Sodium hydrate, 4 grains; water, 500 CC. To use, one part each with water 2 parts. Add 3 drops saturated solution bromide of potassium to every 400 CC. of developer.

Pyro. For Night Subjects (Robert Dykes).—Stock solution—Pyro, 1 ounce; potassium bromide, 60 grains; potassium meta-bisulphite, 50 grains; distilled water to make 12 ounces. No. 1. Take stock solution 3 ounces, add 2 ounces boiled water. No. 2. Sulphite soda (anhydrous), 1 ounce; carbonate soda (dry), 1 ounce; water (boiled) to make 20 ounces. For use, 4 drams No. 1 to 5 drams No. 2 in 16 ounces of water.

Pyro. For Overtimed Plates (J. D. Elliott).—Sulphite soda, 40° solution, 4 ounces; water, 4 ounces; pyro, 10 grains. Immerse plates in this solution for 20 minutes in the dark; then add to above solution $\frac{1}{2}$ drachm carbonate soda, 20° solution. When image appears add one more drachm of the carbonate soda solution.

Pyro. (W. M. Keck).—Pyro, 20 grains; sodium carbonate (dry), 40 grains; sodium sulphite (dry), 60 grains; water, 16 ounces. For either tray or tank development. Time six minutes.

Pyro Tray Film Developer. (J. E. Carson).—No. 1 solution, boiled water or rain water, 8 ounces or 240 C.C.s.; potassium metabisulphite, 60 grains or 3.55 grams; pyro, 120 grains, or 7.70 grams. No. 2 stock solution; boiled or rain water, 8 ounces, or 240 C.C.s.; sulphite soda anhydrous, 328 grains, or 21 $\frac{1}{2}$ grams; carbonate soda, 219 grains, or 14 $\frac{1}{4}$ grams. For developing use half ounce or 15 cubic centimeters of each solution, and four ounces or 120 C.C.s water. Develop for five minutes at 65 degrees.

Pyro-Metol. For plates (H. M. Long).—A. Water, 22 $\frac{1}{2}$ ounces; metabisulphite, 2 dram; metol, 60 grains; pyro, 1 ounce. B. Water, 16 ounces; sulphite soda (anhydrous), 2 ounces. C. Water, 16 ounces; carbonate soda (dry), 1 ounce. Normally used 1 ounce of each stock to 16 of water.

TANK DEVELOPERS FOR NEGATIVES

Metol-Hydro (Frew).—Water, 12 ounces; metol, 7 $\frac{1}{2}$ grains; sulphite soda (anhydrous), 274 grains; hydroquinone, 30 grains; carbonate soda (anhydrous), 150 grains; bromide potassium, 2 grains. For use to each ounce of above add 4 ounces of water; temperature, 65 degrees; time, 12 minutes.

Monomet-Hydro-Pyro (John Boyd).—Monomet, 4 grains; hydroquinone, 4 grains; pyro, 4 grains; metabisulphite potassium, 4 grains; carbonate of soda, dessicated, 40 grains; sulphite of soda (anhydrous), 60 grains; bromide of potassium, 1 grain; water, 4 ounces. For tank development use 28 ounces of water. Development 20 minutes at 65 degrees.

Pyro (George D. Jopson).—No. 1. Water, 16 ounces; meta-bisulphite of potash, 70 grains; pyro, 1 ounce; bromide potassium, 8 grains. Mix in order given. No. 2. Sulphite soda, 60° test. No. 3. Carbonate soda, 40° test. To use, mix $2\frac{1}{2}$ ounces of No. 1, 2 and 3 in rotation, add 57 ounces of water. Develop 20 minutes at 65°.

Rodinal or Azol.—Water, 60 ounces; rodinal or azol, 1 ounce; temperature, 65 degrees; time, 25 minutes.

DEVELOPERS FOR LANTERN SLIDES

Hydroquinone (B. H. Allbee).—No. 1. Hydroquinone, 150 grains; metabisulphite potash, 10 grains; bromide potassium, 50 grains; water, 20 ounces. No. 2. Sulphite of soda (anhydrous), 1 ounce; caustic soda, 100 grains; water, 20 ounces. Take equal parts of No. 1 and No. 2.

Hydroquinone. One Solution for Warm Tones (A. H. Farrow). Hydroquinone, 1 dram; sulphite of soda (anhydrous), 2 drams; carbonate of soda (dry), 4 drams; bromide of potassium, 20 grains; water, 12 ounces.

Hydroquinone. For Colder Tones (B. H. Allbee).—No. 1. Hydroquinone, 60 grains; sulphite of soda (anhydrous), 1 ounce; citric acid, 10 grains; bromide potassium, 10 grains; water, 10 ounces. No. 2. Carbonate of soda (dry), 1 ounce; water, 10 ounces. Use equal parts.

FIXING BATHS AND HARDENERS

Fixing and Hardening Bath. For Plates, Films and Papers. (W. A. Alcock).—In hot weather, hypo, 1 lb.; epsom salts, 1 lb.; water, 100 oz. In cold weather, hypo, 1 lb.; epsom salts, $\frac{1}{2}$ lb.; water, 100 oz.

Acid Fixing Bath (Carbutt).—Sulphuric acid, 1 dram; sodium hyposulphite, 16 ounces; sulphite of soda (anhydrous), 2 ounces; chrome alum, 1 ounce; warm water, 64 ounces. To prepare the bath, dissolve the hypo in 48 ounces of water, the sulphite of soda in 6 ounces; mix the sulphuric acid with 2 ounces of the water and pour slowly into the sulphite solution and then add to the hypo solution. Dissolve the chrome alum in 8 ounces of water; add to the bulk of the solution and the bath is ready for use.

Fixing Bath for Lantern Slides (B. H. Allbee).—Sulphuric acid, 1 dram; hypo, 16 ounces; sulphite of soda (anhydrous), 1 ounce; chrome alum, 1 ounce; water, 64 ounces.

Plain Fixing Bath.—Dissolve 1 pound of sodium hyposulphite in 2 quarts of water, or 4 ounces of the hypo in a pint of water, according to the bulk of the solution required.

Hardener for Fixing Bath (Beach).—Water, 40 ounces; sulphite of soda (anhydrous), 3 ounces; powdered alum, 16 ounces; acetic acid, 40 ounces. Add in the order given and shake well until dissolved. Of the above add 16 ounces to each gallon of hyposulphite of soda solution, testing 70 to 80 degrees.

Hardening Negatives.—Immerse them for a few minutes in formalin, 1 ounce; water, 30 ounces.

Short Stop, removes developer stains; renders an acid fixing bath unnecessary when making D. O. P. or bromide prints, and destroys stains on both prints and fingers. (J. E. Carson).—Potassium metabisulphite, 1 ounce or 30 C.C.s.; water, 32 ounces, or 960 C.C.s. When thoroughly dissolved add 10 drops C. P. sulphuric Acid. This bath should have a light sulphur dioxide odor after standing awhile. If not, add acid drop by drop until odor appears.

INTENSIFICATION

Intensifier, One Solution (F. M. Steadman).—No. 1. Bichloride of mercury, $\frac{1}{2}$ ounce; water, 10 ounces. No. 2. Iodide of potassium,

5 drams; water, $1\frac{1}{2}$ ounces. Add to No. 1. No. 3. Hyposulphite of soda, 1 ounce; water, $2\frac{1}{2}$ ounces. Add to the previous mixture. This clears the solution when it is ready for use for local intensification. For tray intensification add more water to slow its action.

Intensifying with Red Ink (E. M. Cohen).—Soak the negative well. Put teaspoon of red ink into tray of water and rock until mixed. Immerse negatives face up till well and evenly colored, then without washing put in drying frame. If left in solution too long will be over dense, in which case several trays of clear water will eliminate some of the color.

The intensification is permanent without the danger of negative going bad, as is the case when mercury is used.

Intensifier—Mercuric Chloride Process.—No. 1. Mercuric chloride, 200 grains; bromide of potassium, 120 grains; water, $6\frac{1}{2}$ ounces. No. 2. Sulphite of soda (anhydrous), 1 ounce; water, 4 ounces. The well-washed negative, free from hypo, must be thoroughly bleached in No. 1; well washed; and then blackened in No. 2. After blackening it is well washed again.

REDUCTION

Reducer, Single Solution (F. M. Steadman).—Red prussiate of potash, size of pea; hyposulphite of soda, six times that volume; water, 6 ounces (for local reduction, $1\frac{1}{2}$ ounces.) When reduced wash thoroughly.

Reducer—Ammonium Persulphate.—Ammonium persulphate, 15 grains; water, 1 ounce. The solution should be made just before use. The negative must be perfectly free from hypo or it will be stained by the persulphate. When the desired reduction has been reached, transfer the negative without washing to a 10 per cent. solution of anhydrous sodium sulphite. Wash finally for 15 or 20 minutes.

Reducer—Farmer's.—Dissolve 1 ounce of potassium ferricyanide in 9 ounces of water and make up to 10 ounces, forming a 10 per cent. solution. Label this poison. Thoroughly wet the negative to be reduced. Take enough fresh plain hypo fixing bath for the purpose, and add to it enough of the ferricyanide solution to make it a light straw color. The negative to be reduced is immersed in this solution, when it will be seen to lose density. Rock the tray to insure evenness of action. This reducer can also be used for local treatment.

PRINTING PROCESSES

Blue Prints

Blue Printing Sensitizing Formulæ (Brown).—A. Dissolve 110 grains ferric ammonium citrate (green) in 1 ounce of water. B. Dissolve 40 grains of potassium ferricyanide in 1 ounce of water. These two solutions are made up separately. They are then mixed together and kept in a stoneware bottle, but the single solution should always be filtered before use. The mixture will retain its good qualities for months if kept from the light.

(Millen).—Potassium ferricyanide, 1 ounce; ammonic citrate of iron, $1\frac{1}{2}$ ounces; distilled water, 10 ounces. Mix thoroughly and filter. The solution should have a deep wine color and dry on the paper a lemon-yellow. If the solution is green and has a precipitate, the ammonio-citrate is old and spoiled. The mixture should be kept from the light.

Bromide Paper

Bromide Paper Developers: Hydroquinone-metol. No. 1. Water, 10 ounces; hydroquinone, 52 grains; potassium metabisulphite, 18 grains; sulphite of soda (anhydrous), 5 drams; carbonate of soda,

1¼ ounces. No. 2. Water, 10 ounces; metol, 30 grains; carbonate of soda, 5 drams; sulphite of soda (anhydrous), 5 drams. One or two drops of a potassium bromide 10 per cent. solution added to 1 ounce of the mixed developer will increase contrast and keep the whites pure. Equal parts of 1 and 2 give excellent prints from a normal negative; one part of 1 and two of 2 give gray prints with maximum half-tone and gradation; two parts of 1 and one of 2 give vigorous prints from soft delicate negatives.

Amidol for rich blacks (freshly prepared). Distilled (or boiled) water, 4 ounces; sulphite of soda (anhydrous), 45 grains; amidol, 10 to 15 grains. Add a drop of 10 per cent. bromide solution to each ounce of developer.

Sepia Tones: Hypo Alum.—Hyposulphite of soda, 5 ounces; ground alum, 1 ounce; boiling water, 70 ounces. Dissolve the hypo in the water, and then add the alum slowly. A milk-white solution results which should be decanted when clear. It is not used until cold (about 60° Fahr.).

Sepia Tones: Sulphide of Sodium.—The fixed and washed print is treated with one of the following solutions: (1) Potassium ferricyanide, 10 grains; potassium bromide, 10 grains; water, 1 ounce; or (2) potassium ferricyanide, 20 grains; sodium chloride (common salt), 30 grains; water, 1 ounce. The image will be bleached by either of these solutions in a few minutes, the whitish appearance of the deposit being caused by its change into a salt of silver. After 5 minutes in running water apply the sulphuretting solution: Dissolve 3 ounces of sodium monosulphide in 15 ounces of water; boil the solution for about 10 minutes, filter off the black precipitate formed, and when cooled make up to 25 ounces with water. To tone take of the sulphide solution 1 ounce and add water 12 to 20 ounces.

Red Tones: Copper.—Dissolve 100 grains of ammonium carbonate in 2 ounces of water, and in this solution dissolve 10 grains of sulphate of copper. Then add 20 grains of potassium ferricyanide. A clear, dark green solution results which gives a red-chalk tone in about 3 minutes. Tone until the deepest shadow is converted, and then wash the print for 10 minutes.

Green Tones: Vanadium.—Bleach print in the following: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce. Wash well and apply: Ferric chloride, 2 grains; vanadium chloride, 2 grains; ammonium chloride, 4 grains; hydrochloric acid, 5 minims; water, 1 ounce.

Blue Tones: Iron.—Bleach print in: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce; then tone in ferric chloride, 5 grains; hydrochloric acid, 5 minims; water, 1 ounce.

To prevent blistering on bromide paper (P. L. Anderson).—Immerse after fixing and before washing from 10 to 15 minutes in water, 10 ounces; formaldehyde, 1 ounce. A 10 per cent. solution of chrome alum will do equally well.

To make bromide paper translucent (P. L. Anderson).—Lay the paper negative face down on a blotter and paint thinly with the following mixture. Give three coats. Turpentine, 3 ounces; powered resin, 1 ounce; gum elemi, 1 ounce; paraffine wax, ½ ounce. Heat with stirring until it begins to boil. Allow to cool slightly and add turpentine, 3 ounces.

Carbon Tissue

Carbon Tissue, Sensitizer for (Bennett).—Potassium bichromate, 4 drams; citric acid, 1 dram; strong ammonia water, about 3 drams; water, 25 ounces; dissolve the bichromate and citric acid in hot water, and add sufficient ammonia to change the orange color of the solution to lemon-yellow. Sensitize for 90 seconds; reducing the water softens

the gradation in the print; increasing it to 30 ounces gives more vigor.

Carbon Lantern Slides.—Prepare the glass by coating with the following preparation: 180 grains of Nelson's Gelatine No. 1, in 20 ounces water. Add 10 grains bichromate of potash. Dry and allow the plate to be exposed to light for a couple of days to make the coating thoroughly insoluble. Sensitizer for tissue: 1 per cent. to $1\frac{1}{4}$ per cent. solution of bichromate of potash. Immerse 2 minutes. Print deeply; expose twice as long as ordinary paper print. Develop in hot water as usual.

Gum Bichromate

Gum Bichromate (Casper Millar). A.—Gum arabic, $1\frac{1}{4}$ ounces; water, $3\frac{1}{2}$ ounces; salicylic acid, 4 grains.

B.—Chrome alum, 45 grains; water, $3\frac{1}{2}$ ounces. Grind A and B with water and pigment, brush over paper, dry and store.

Suggested formula.—A. 2 ounces; B, $1\frac{1}{2}$ drams; carbon black, 10 grains; sensitize for 2 minutes in 5 per cent. bichromate solution.

Kallitype

Kallitype Sensitizer for Black Tones (J. Thomson).—Distilled water, 1 ounce; ferric oxalate (Merck's or Mallinckrodt's), 15 grains; citrate of iron and ammonia (brown scales), 25 grains; chloride of copper, 8 grains; oxalate of potassium, 35 grains; oxalic acid, 15 grains; silver nitrate, 15 grains; gum arabic, 10 grains. For greater contrast add 1 to 10 drops 5 per cent. bichromate of potassium solution.

Developer: Stock Solution.—Distilled water, 1 ounce; silver nitrate, 40 grains; citric acid, 10 grains; oxalic acid, 10 grains. Filter. Normal developer 1 dram stock solution and 7 drams of water.

Platinum Papers

Platinum Sensitizer (P. L. Anderson).—Stock solutions: I. Water, hot, distilled, 2 ounces; ferric oxalate, 240 grains; oxalic acid, 16 grains. II. Water, hot, distilled, 2 ounces; ferric oxalate, 240 grains; oxalic acid, 16 grains; potassium chlorate, 4 grains. III. Water, distilled, 19 drams; potassium chloroplatinite, 219 grains ($=\frac{1}{2}$ ounce). Keep in amber glass bottles or in the dark. For use take: I, 22 mm.; II, 0 mm.; III, 24 mm. Gives very soft prints. Or, I, 12 mm.; II, 10 mm.; III, 24 mm. Results about the same contrast as a P. O. P. print. Or, I, 0 mm.; II, 22 mm.; III, 24 mm. Gives extreme contrast.

Above quantities sufficient for a 10 x 12 sheet of ordinary paper. Very smooth requires less and very rough more, up to 25 per cent. additional. Apply with a soft fitch or camel-hair brush, allow to surface dry, and make bone-dry over a stove or gas jet. Should dry in not less than five or more than ten minutes.

Platinum: Sensitizing Gold Bath and Sepia Papers. A.—Chloroplatinite of potassium, 15 grains; distilled water, 90 minims.

B.—Ferric oxalate, 21 grains; oxalic acid, 2 grains; distilled water, 183 minims. For cold bath paper, mix A and B, and add 15 minims of water. For sepia paper mix A and B and add 15 minims of a 5 per cent. solution of mercuric chloride. The addition of a few grains of potassium chlorate to any of the above gives increased contrast in the print. From 140 to 170 minims of solution are sufficient to coat a sheet of paper 20 x 26 inches.

Platinum Prints: to Intensify. A.—Sodium formate, 45 grains; water, 1 ounce.

B.—Platinum perchloride, 10 grains; water, 1 ounce.

C.—For use, take 15 minims each of A and B to 2 ounces of water. Immerse prints until sufficiently intensified, then remove and wash.

Platinum Prints to Distinguish from Bromide.—Soak the print in saturated solution of mercuric chloride; a platinum print will not change; a bromide print will bleach.

Salted Papers

Salted Paper Prints: Sensitized with the following: Silver, 480 grains Troy; water, 11 ounces. Dissolve and pour off 2 ounces, and to the 9 ounces left add strong aqua ammonia to form a precipitate and redissolve the precipitate, then add the remaining 2 ounces which will form another precipitate; to this add 9 drops of nitric acid C. P. Apply this to the paper with a tuft of cotton.

Any good toning bath will give good results, such as—Chloride aluminum, 80 grains; bi-carbonate soda, 360 grains; water, 48 ounces. When mixed this will form a flaky hydrate which will settle to the bottom. It can be strained through clean washed muslin. To prepare a small bath for toning, take 12 ounces of the stock solution and add sufficient gold to tone in 8 to 10 minutes. The gold solution must be neutralized with bi-carbonate soda before adding to the above bath. When the prints reach the desired tone throw them into a bath of salt water, made of water, 1 gallon; table salt, 1 ounce.

Printing Out Papers

Gold Toning (B. H. Allbee).—No. 1, 10 per cent. solution sulphocyanide of potassium; No. 2, 15 grains chloride of gold in 7½ ounces of water; No. 3, 10 per cent. solution phosphate of soda; No. 4, saturated solution borax. Take No. 1, 1 dram, water, 8 drams; No. 2, 4 drams; No. 3, 1 dram; No. 4, 2 drams. In this put print in dry. Toning should be complete in two minutes. Wash as usual.

Gold Toning.—For blue-black tones, for slight strengthening, and for converting rusty black into pure black. Soak prints in warm water, lay on warm glass, brush over glycerine and blot off. Pour on few minims of solution of gold chloride (1 grain per dram), and rapidly brush in all directions. When toned, rinse, and sponge back and front with: Metol, 50 grains; sodium sulphite, 1 ounce; potassium carbonate, ½ ounce; water, 20 ounces. Tone in daylight. Do not tone sepias or old prints in this solution.

Gold Toning—To Give Black Tones (A. B. Klugh).—Solution A. Sodium thiosulphate (hypo), 40 grams; water, 100 cc. Solution B. Lead nitrate, 5 grams; acetic acid, glacial, 5 cc.; water, 50 cc. Add to solution A enough of B to produce a slight milkiness. Filter and add 25 cc. of a 1% solution of gold chloride. Print deeply and tone until a warm black is produced.

MISCELLANÆ

Adhesive for Labels.—Soak 1 part of the best glue in water until thoroughly swollen, add a little sugar candy, 1 part of gum arabic and 6 parts of water. Boil with constant stirring over a spirit lamp until the whole gets thin. Coat sheets of paper with it; let dry and cut up into convenient sizes.

Autochromes.—Sensitizing to get more speed (M. G. Lovelace).—In complete darkness bathe plates in the following solution: Distilled water, 66 cc.; ethyl alcohol, pure, 90 deg., 33 cc.; dye solution, 2 cc.; ammonia, .30 cc. The dye solution is a mixture of pinachrome, pina verdol and pinacyanol, 1 part of each in 1000 of alcohol. Bathe plates for five minutes and dry away from dust. These plates require a special filter the formula being: Hard gelatine, 3 gms.; distilled water, 100 cc.; filter yellow K, 1 per cent. solution, 2.5 cc. Use 1 cc. to each 10 square centimeters of surface. These plates have about five times the speed and it is possible to make snap shots with them if a lens working at F/4.5 and F/5.6 is used.

Blackening Mixture.—Dissolve a 4-ounce stick of licorice in 8 ounces of water with the aid of gentle heat. When dissolved rub into the mixture 1 ounce of burnt sienna in powder, using the back of a spoon for this purpose. When cold, bottle for use.

Blackening Brass.—Make two solutions: Copper nitrate, 200 grains;

water, 1 ounce. Silver nitrate, 200 grains; water, 1 ounce. Mix the solutions; clean the article well; dip it in the solution for a moment; withdraw it; dry it; and heat it strongly.

Black, Dead, for Wood.—Shellac, 40 parts; borax, 20 parts; glycerine, 20 parts; water, 500 parts. When dissolved, add 50 parts aniline black.

Cleaning Greasy Bottles.—Wash with benzine, or permanganate of potassium, to which has been added some hydrochloric acid.

Bottles that have contained resinous substances, wash with potash or soda and rinse with alcohol. Bottles that have contained essences, wash with sulphuric acid, then with water.

Clearing Stained Negatives.—Dissolve $\frac{1}{8}$ ounce of pulverized alum in 20 ounces of water and add 1 dram of sulphuric acid. Immerse the stained plate in this solution for a few minutes; remove plate, wash and then set in the rack to dry.

Film: to Remove from Glass. Make two solutions. A.—Sodium fluoride, 6 grains; water, 4 ounces.

B.—Sulphuric acid, 6 drops; water, 1 ounce. Place the negative in solution A for 2 minutes and then place directly in solution B. After another 2 minutes lift the film with the finger from one corner of the plate. It will soon leave the glass.

Firelight Effects on Developing Paper (H. S. Hood). No. 1.—Water, 5 drams; copper sulphate, 10 per cent. solution, 15 minims; ammonium carbonate, 10 per cent. solution. Add till precipitate first formed is redissolved.

No. 2.—Water, $4\frac{1}{2}$ ounces; potassium ferricyanide, $\frac{6}{10}$ drams. Mix separately and add No. 2 to No. 1. The print will turn bright red. Wash well.

Ground Glass: Substitutes for. 1.—Paraffine wax makes an excellent substitute for ground glass if the latter should get broken. Iron the paper onto a sheet of plain glass. It is more transparent than the focusing screen and the image will appear clearer; hence, in exposing allowance must be made for the difference in illumination.

2.—Resin dissolved in wood alcohol and blown over the glass; this must not be scratched; it gives a very fine-grained ground glass effect.

3.—White wax, 120 grains; ether, 1 ounce.

Ground Glass Varnish: Sandarac, 90 grains; mastic, 20 grains; ether, 2 ounces. Dissolve the resins in the ether and add benzole $\frac{1}{2}$ to $1\frac{1}{2}$ ounces.

Lens: to Clean.—The lens should always be kept free from dust or other impurities. To clean it, spread upon a table a clean sheet of paper; take the lens apart, and with a camel-hair brush dust each of the combinations on both sides. If the surfaces of the lenses are very dirty and have lost their polish, make up the following: Nitric acid, 3 drops; alcohol, 1 ounce; distilled water, 2 ounces. Dip a tuft of filtering cotton in this solution, rub each side of the lens, then polish with an absolutely clean chamois. Clean the lens tube before replacing the lenses, each of which should be finally dusted with a camel-hair brush.

Moonlight Effects on Developing Paper (H. S. Hood).—Immerse in water, 5 ounces; ferric ammonium citrate, 12 grains; potassium ferricyanide, 12 grains; nitric acid, $\frac{2}{5}$ drams. Prints will assume a blue color. Wash until whites become clear.

Mounting Without Cockling (W. S. Davis).—Coat back of dry print with as strong a solution of warm gelatine (pure table gelatine will do) as can be spread easily. Allow to dry, then attach to mount by dampening the amount with water, then lay print in desired position; cover with a sheet of bond or smooth paper, and apply a warm flat iron until the gelatine melts. Very effective for thin mounting material, as there is no cockling if the mount contains just the right amount of water.

Paste, Starch (A. Lomax).—Powdered starch, 1 ounce; cold water, 12 ounces. Mix smooth with a glass rod, heat to boiling point. Boil half a minute stirring all the time. Use cold.

Poisons and Antidotes.—Administer the antidote as soon as possible. If a strong acid or alkali, or cyanide of potassium, has been swallowed, lukewarm water in large quantities should be swallowed at once. Where strong acids or alkalies have not been swallowed, rid the stomach of the poison by vomiting; for this purpose take 25 grains of zinc sulphate in warm water.

Polished surfaces: to Photograph.—Smear the surface with soft putty so as to deaden the reflections. Photograph the article against a black background, and stop off all reflections, allowing the light to come from one direction only. To photograph hollow cut glassware fill with ink or aniline black water dye. Before photographing machinery deaden the bright parts with putty.

Safe Light for Panchromatic Plates.—Take old dry plates and coat with the following: Water, 10 ounces, tartrazine, 75 grains; patent blue A, 75 grains; naphthol greens, 75 grains; sulphuric acid, 30 minims. Stain the plates as deeply as possible. Use two plates.

Stains: to Remove from the Hands.—Developer stains: solution of citric or oxalic acid. Silver nitrate stains: Water, 4 ounces; chloride of lime, 350 grains; sulphate of soda, 1 ounce. Apply with a brush.

Tarnished Daguerreotypes, to Restore.—Remove the silvered plate from the case and place it, image uppermost, under a box lid or other protector from dust, etc. Put a small piece of potassium cyanide into a graduate and pour over it 1 or 2 ounces of water. Hold the daguerreotype by the corner with a pair of pliers, rinse it in clear running water, then pour over it the weak cyanide solution (a 3 per cent. solution is usually employed), and return it to the graduate. Repeat this operation several times until the discoloration quite disappears. Wash well in running water, and then, before the surplus water has time to collect in tears upon the image, begin to dry the plate gradually over a spirit lamp, holding the plate in an inclined position so that it will dry from the uppermost corner. The secret of success is in the use of pure water for the final washings and the drying of the image without check or the formation of tears.

Test for Hypo: Potassium permanganate, 2 grains; potassium carbonate, 20 grains; distilled water, 40 ounces. Soak the plate or print to be treated in water for one hour, then remove and add to the water a few drops of the above solution, which will turn a greenish yellow or brown if the water is not free from hypo.

To Flatten Double-weight Prints (George D. Jopson).—A—9 ounces boiling water; $\frac{1}{2}$ ounce gelatine. B—3 ounces boiling water; $\frac{1}{2}$ drachm alum. C—2 drachms oil of cloves. Mix and strain through cheese cloth while hot. To use take a little from the stock and place in a cup. Place cup in hot water until backing is dissolved. Apply very thin to back of print with soft cloth or a tuft of cotton.

COMPARISON OF VALUES COMPILED BY CHAS. LE B. GOELLER

Taking for a standard f.8 as unit of measurement.
Speed increased. Opening twice as fast.

f:8	= 1	Twice as fast	as f:11.3	exposure 1 sec.
7.5	= $1\frac{1}{8}$	"	as 10.6	" 0.88 sec.
6.8	= $1\frac{3}{8}$	"	as 9.6	" 0.725 "
6.3	= $1\frac{3}{5}$	"	as 8.8	" 0.625 "
6.	= $1\frac{7}{9}$	"	as 8.5	" 0.5625 "
5.6	= 2.	"	as 8	" 0.5 "
4.5	= $3\frac{1}{6}$	"	as 6.3	" 0.3125 "

UNITED STATES WEIGHTS AND MEASURES

According to Existing Standards

LINEAR

	Inches	Feet	Yards	Rods	Fur's	Mi.
12 inches = 1 foot.	12 =	1				
3 feet = 1 yard.	36 =	3 =	1			
5.5 yards = 1 rod.	198 =	16.5 =	5.5 =	1		
40 rods = 1 furlong.	7,920 =	660 =	220 =	40 =	1	
8 furlongs = 1 mile.	63,360 =	5,280 =	1,760 =	320 =	8 =	1

SURFACE—LAND

	Feet	Yards	Rods	Roods	Acres
144 sq. ins. = 1 sq. ft.					
9 sq. ft. = 1 sq. yd.	9 =	1			
30.25 sq. yds. = 1 sq. rod.	272.25 =	30.25 =	1		
40 sq. rods = 1 sq. rood.	10,890 =	1,210 =	40 =	1	
4 sq. roods = 1 acre.	43,560 =	4,840 =	160 =	4 =	1
640 acres = 1 sq. mile.	27,878,400 =	3,097,600 =	102,400 =	2,560 =	640

VOLUME—LIQUID

	Gills	Pints	Gallon	Cub. In.
4 gills = 1 pint.	32 =	8 =	1 =	231
2 pints = 1 quart.				
4 quarts = 1 gallon.				

FLUID

Gallon	Pints	Ounces	Drachms	Minims	Cubic Centimetres
1 =	8 =	128 =	1,024 =	61,440 =	3,785,435
	1 =	16 =	128 =	7,680 =	473,179
		1 =	8 =	480 =	29,574
			1 =	60 =	3,697

16 ounces, or a pint, is sometimes called a fluid pound.

TROY WEIGHT

Pound	Ounces	Pennyweights	Grains	Grams
1 =	12 =	240 =	5,760 =	373.24
	1 =	20 =	480 =	31.10
		1 =	24 =	1.56

APOTHECARIES' WEIGHT

lb.	℥	℥	℥	gr.	Grams
Pound	Ounces	Drachms	Scruples	Grains	
1 =	12 =	96 =	288 =	5,760 =	373.24
	1 =	8 =	24 =	480 =	31.10
		1 =	3 =	60 =	3.89
			1 =	20 =	1.30
				1 =	.06

The pound, ounce, and grain, are the same as in Troy weight.

AVOIRDUPOIS WEIGHT

Pound	Ounces	Drachms	Grains (Troy)	Grams
1 =	16 =	256 =	7,000 =	453.60
	1 =	16 =	437.5 =	28.35
		1 =	27.34 =	1.77

ENGLISH WEIGHTS AND MEASURES

APOTHECARIES' WEIGHT

20 Grains	=	1 Scruple	=	20 Grains.
3 Scruples	=	1 Drachm	=	60 Grains.
8 Drachms	=	1 Ounce	=	480 Grains.
12 Ounces	=	1 Pound	=	5,760 Grains.

FLUID MEASURE

60 Minims	=	1 Fluid Drachm
8 Drachms	=	1 Fluid Ounce
20 Ounces	=	1 Pint
8 Pints	=	1 Gallon

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT

27 $\frac{1}{32}$ Grains	=	1 Drachm	=	27 $\frac{1}{32}$ Grains
16 Drachms	=	1 Ounce	=	437 $\frac{1}{2}$ Grains
16 Ounces	=	1 Pound	=	7,000 Grains

Precious Metals are usually sold by

TROY WEIGHT

24 Grains	=	1 Pennyweight	=	24 Grains
20 Pennyweights	=	1 Ounce	=	480 Grains
12 Ounces	=	1 Pound	=	5,760 Grains

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only 437 $\frac{1}{2}$ grains.

UNITED STATES FLUID MEASURE

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1	= 8	= 128	= 1,024	= 61,440	= 231.	= 58,328.886	= 3,785.44
	1	= 16	= 128	= 7,680	= 28.875	= 7,291.1107	= 473.18
		1	= 8	= 480	= 1.8047	= 455.6944	= 29.57
			1	= 60	= 0.2256	= 56.9618	= 3.70

IMPERIAL BRITISH FLUID MEASURE

Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1	= 8	= 160	= 1,280	= 76,800	= 277.27384	= 70,000
	1	= 20	= 160	= 9,600	= 34.65923	= 8,750
		1	= 8	= 480	= 1.73296	= 437.5
			1	= 60	= 0.21662	= 54.69

METRIC SYSTEM OF WEIGHTS AND MEASURES

MEASURES OF LENGTH

DENOMINATIONS AND VALUES		EQUIVALENTS IN USE	
Myriameter.....	10,000 meters.	6.2137	miles.
Kilometer.....	1,000 meters.	.62137	mile, or 3,280 ft. 10 ins
Hectometer.....	100 meters.	328.	feet and 1 inch.
Dekameter.....	10 meters.	393.7	inches.
Meter.....	1 meter.	39.37	inches.
Decimeter.....	1-10th of a meter.	3.937	inches.
Centimeter.....	1-100th of a meter.	.3937	inch.
Millimeter.....	1-1000th of a meter.	.0394	inch.

MEASURES OF SURFACE

DENOMINATIONS AND VALUES		EQUIVALENTS IN USE	
Hectare.....	10,000 square meters.	2.471	acres.
Are.....	100 square meters.	119.6	square yards.
Centare.....	1 square meter.	1,550.	square inches

MEASURES OF VOLUME

DENOMINATIONS AND VALUES			EQUIVALENTS IN USE	
NAMES	No. of Liters	CUBIC MEASURES	DRY MEASURE	WINE MEASURE
Kiloliter or stere.....	1,000	1 cubic meter.	1.308 cubic yards.	264.17 gallons.
Hectoliter....	100	1-10th cubic meter.	2 bu. and 3.35 pecks.	26.417 gallons.
Dekaliter....	10	10 cubic decimeters.	9.08 quarts.	2.6417 gallons.
Liter.....	1	1 cubic decimeter.	.908 quart.	1.0567 quarts.
Deciliter....	1-10	1-10th cubic decimeter.	6.1023 cubic inches.	.845 gill.
Centiliter....	1-100	10 cubic centimeters	.6102 cubic inch.	.338 fluid oz.
Milliliter....	1-1000	1 cubic centimeter.	.061 cubic inch.	.27 fl. drin.

WEIGHTS

DENOMINATIONS AND VALUES			EQUIVALENTS IN USE	
NAMES	Number of Grams	WEIGHT OF VOLUME OF WATER AT ITS MAXIMUM DENSITY	AVOIRDUPOIS WEIGHT	
Millier or Tonneau.....	1,000,000	1 cubic meter.	2204.6	pounds.
Quintal.....	100,000	1 hectoliter.	220.46	pounds.
Myriagram.....	10,000	10 liters.	22.046	pounds.
Kilogram or Kilo.....	1,000	1 liter.	2.2046	pounds.
Hectogram.....	100	1 deciliter.	3.5274	ounces.
Dekagram.....	10	10 cubic centimeters.	.3527	ounce.
Gram.....	1	1 cubic centimeter.	15.432	grains.
Decigram.....	1-10	1-10th of a cubic centimeter.	1.5432	grain.
Centigram.....	1-100	10 cubic millimeters.	.1543	grain.
Milligram.....	1-1000	1 cubic millimeter.	.0154	grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about $2\frac{1}{2}$ acres. The unit of capacity is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. The unit of weight is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c., is generally used instead of milliliter and cubic meter instead of kiloliter.

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE

1 cubic centimeter	=	17 minims			
2 cubic centimeters	=	34 "			
3 "	=	51 "			
4 "	=	68 "	or 1 dram	8 minims	
5 "	=	85 "	" 1 "	25 "	
6 "	=	101 "	" 1 "	41 "	
7 "	=	118 "	" 1 "	58 "	
8 "	=	135 "	" 2 drams	15 "	
9 "	=	152 "	" 2 "	32 "	
10 "	=	169 "	" 2 "	49 "	
20 "	=	338 "	" 5 "	38 "	
30 "	=	507 "	" 1 ounce	0 dram	27 minims
40 "	=	676 "	" 1 "	3 drams	16 "
50 "	=	845 "	" 1 "	6 "	5 "
60 "	=	1014 "	" 2 ounces	0 "	54 "
70 "	=	1183 "	" 2 "	3 "	43 "
80 "	=	1352 "	" 2 "	6 "	32 "
90 "	=	1521 "	" 3 "	1 "	21 "
100 "	=	1690 "	" 3 "	4 "	10 "
1000 "	=	1 liter =	35 "	1 "	40 "

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT

The following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes.

1 gram	=	15 $\frac{2}{5}$ grains.			
2 grams	=	30 $\frac{4}{5}$ "			
3 "	=	46 $\frac{1}{5}$ "			
4 "	=	61 $\frac{4}{5}$ "	or	1 dram	14 $\frac{2}{5}$ grain
5 "	=	77 $\frac{1}{5}$ "	"	1 "	17 $\frac{1}{5}$ grains
6 "	=	92 $\frac{3}{5}$ "	"	1 "	32 $\frac{3}{5}$ "
7 "	=	108 "	"	1 "	48 "
8 "	=	123 $\frac{2}{5}$ "	"	2 drams	3 $\frac{2}{5}$ "
9 "	=	138 $\frac{4}{5}$ "	"	2 "	18 $\frac{4}{5}$ "
10 "	=	154 $\frac{2}{5}$ "	"	2 "	34 $\frac{2}{5}$ "
11 "	=	169 $\frac{4}{5}$ "	"	2 "	49 $\frac{4}{5}$ "
12 "	=	185 $\frac{1}{5}$ "	"	3 "	51 $\frac{1}{5}$ "
13 "	=	200 $\frac{3}{5}$ "	"	3 "	20 $\frac{3}{5}$ "
14 "	=	216 "	"	3 "	36 "
15 "	=	231 $\frac{2}{5}$ "	"	3 "	51 $\frac{2}{5}$ "
16 "	=	247 "	"	4 "	7 "
17 "	=	262 $\frac{2}{5}$ "	"	4 "	22 $\frac{2}{5}$ "
18 "	=	277 $\frac{4}{5}$ "	"	4 "	37 $\frac{4}{5}$ "
19 "	=	293 $\frac{1}{5}$ "	"	4 "	53 $\frac{1}{5}$ "
20 "	=	308 $\frac{3}{5}$ "	"	5 "	8 $\frac{3}{5}$ "
30 "	=	463 "	"	7 "	43 "
40 "	=	617 $\frac{1}{5}$ "	"	10 "	17 $\frac{1}{5}$ "
50 "	=	771 $\frac{3}{5}$ "	"	12 "	51 $\frac{3}{5}$ "
60 "	=	926 "	"	15 "	26 "
70 "	=	1080 $\frac{1}{5}$ "	"	18 "	0 $\frac{1}{5}$ "
80 "	=	1234 $\frac{3}{5}$ "	"	20 "	34 $\frac{3}{5}$ "
90 "	=	1389 "	"	23 "	9 "
100 "	=	1543 $\frac{1}{5}$ "	"	25 "	43 $\frac{1}{5}$ "
1000 "	=	1 kilogram =	32 oz., 1 dr., 12 $\frac{2}{5}$ gr.		

THE ELEMENTS: **THEIR NAMES, SYMBOLS, AND ATOMIC WEIGHTS** **OXYGEN STANDARD.**

Compiled by **HENRY F. RAESS.**

1915

Aluminum...Al	27.10	Holmium....Ho	163.50	Rhodium....Rh	102.90
Antimony..Sb	120.20	Hydrogen....H	1.008	Rubidium...Rb	85.43
Argon.....A	39.88	Indium.....In	114.80	Ruthenium..Ru	101.70
Arsenic....As	74.96	Iodine.....I	126.92	Samarium...Sa	150.40
Barium....Ba	137.37	Iridium.....Ir	193.10	Scandium...Sc	44.10
Bismuth...Bi	208.00	Iron.....Fe	55.84	Selenium....Se	79.20
Boron.....B	11.00	Krypton....Kr	82.92	Silicon.....Si	28.30
Bromine...Br	79.92	Lanthanum...La	139.00	Silver.....Ag	107.88
Cadmium...Cd	112.40	Lead.....Pb	207.10	Sodium.....Na	23.00
Caesium...Cs	132.81	Lithium....Li	6.94	Strontium...Sr	87.63
Calcium...Ca	40.07	Lutecium....Lu	174.00	Sulphur.....S	32.07
Carbon....C	12.00	Magnesium...Mg	24.32	Tantalum...Ta	181.50
Cerium....Ce	140.25	Manganese...Mn	54.93	Tellurium...Te	127.50
Chlorine...Cl	35.46	Mercury....Hg	200.60	Terbium....Tb	159.20
Chromium..Cr	52.00	Molybdenum..Mo	96.00	Thallium...Tl	204.00
Cobalt....Co	58.97	Neodymium..Nd	144.30	Thorium....Th	232.40
Columbium.Cb	93.50	Neon.....Ne	20.20	Thulium....Tm	168.50
Copper....Cu	63.57	Nickel.....Ni	58.68	Tin.....Sn	119.00
Dysprosium Dy	162.50	Niton.....Nt	222.40	Titanium...Ti	48.10
Erbium....Er	167.70	Nitrogen....N	14.01	Tungsten...W	184.00
Europium..Eu	152.00	Osmium.....Os	190.90	Uranium....U	238.50
Fluorine...F	19.00	Oxygen.....O	16.00	Vanadium...V	51.00
Gadolinium.Gd	157.30	Palladium...Pd	106.70	Xenon.....Xe	130.20
Gallium...Ga	69.90	Phosphorus..P	31.04	Ytterbium...Yb	173.50
Germanium.Ge	72.50	Platinum....Pt	195.20	Yttrium....Yt	89.00
Glucium...Gl	9.10	Potassium...K	39.10	Zinc.....Zn	65.37
Gold.....Au	197.20	Praseodymium Pr	140.60	Zirconium...Zr	90.60
Helium....He	3.96	Radium.....Ra	226.40		

**TABLE OF COMPARATIVE PLATE SPEED
NUMBERS**

H & D	Watkins P No.	Wynne F No.	H & D	Watkins P No.	Wynne F No.
10	15	24	220	323	114
20	30	35	240	352	120
40	60	49	260	382	124
80	120	69	280	412	129
100	147	77	300	441	134
120	176	84	320	470	138
140	206	91	340	500	142
160	235	98	380	558	150
200	294	109	400	588	154

The above Watkins and Wynne numbers are equivalent to the H and D, only when the latter is determined in accordance with the directions of Hurter and Driffield, that is with pyro-soda developer and using the straight portion only of the density curve.

To convert H and D into Watkins: Multiply H and D by 50 and divide by 34. For all practical purposes the Watkins P number is $1\frac{1}{2}$ times H and D.

To convert Watkins into Wynne F Nos.: Extract the square root and multiply by 6.4.

The above methods have been approved by the Watkins Meter Company and the Infallible Exposure Meter Company.

THERMO DEVELOPMENT

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TABLE OF TEMPERATURES

Degrees Fahr.	Min. Tray	Min. Tank	Min. Tray	Min. Tank
	T. C. 1.9.		T. C. 2.6	
80	3¼	12	1¼	7¼
78	3½	13	2	8½
76	3¾	14	2½	9½
74	4	15	2½	10½
72	4¼	16	2½	11½
70	4½	17	3	13
68	5	18½	3¼	14½
66	5¼	19½	3½	16
64	5¾	21	4	18
62	6¼	22½	4½	20
60	6¾	24	5	22
58	7	26	5½	24½
56	7½	28	6	27
54	8	30	6½	30
52	8½	32	7½	33
50	9¼	34	8½	37
48	10	37	9½	41½
46	10¾	40	10½	46
44	11½	43	11½	51½
42	12¼	46	12½	57
40	13¼	49	14½	63

TABLE OF DEVELOPMENT SPEEDS

ANSCO FILM, MS. BARNET—Super-speed Ortho, M; Extra Rapid Ortho, MS. Red Seal, M; Red Diamond, MS; Self-screen Ortho, MS; CENTRAL—Special XX., S; Special, M; Comet, M; Colordon, MQ; Panortho, MQ; CRAMER—Crown S; Anchor, MQ; Banner X, S; Inst. Iso., MQ; Med. Iso, MQ; Commercial Isonon, MQ; Portrait Isonon, M; Trichromatic, MQ; Spectrum, MQ; Slow Iso, MQ; Contrast, VVQ. ENSIGN FILM, MS. HAMMER—Special Extra Fast, MS; Extra Fast, M; Aurora Extra Fast, MS; Ortho Extra Fast, M; Ortho Nonhal., M; Fast, MQ; Slow, VQ. Ortho Slow, VQ. ILEFORD—Monarch, VS; Zenith, VS; Special Rapid, VS; Rapid Chromatic, M; Ordinary, Q. IMPERIAL—Flash Light, M; Special Sensitive, MQ; Ortho-

chrome S.S., MQ; Special Rapid, S; Ortho-chrome S.R., MS; Non-filter, MQ. KODAK—Speed Film, S; N.C. Film, S; Portrait Film, S. MARION—Record, S; P.S.; MS. PAGET—XXX M; XXXXX, MS; Swift, S; Ex. Spec. Rap., S; Ortho. Ex. Spec. Rap., MQ; Panchro Ord. Q; Panchro. Color, VQ; Spec. Rap., S; Hydra Panchro., MQ; Hydra Rapid, MQ; PREMO FILM PACK—S. SEED—Graflex, S; 30 Gilt Edge, MS; 25 X, MS; 23, MQ; L Ortho., MQ; Non-halation, MQ; Panchromatic, VQ. STANDARD—Extra, Orthonon, MQ; Polychrome, MQ. STANLEY—5, M; Commercial, MQ. WELLINGTON—Extreme, S; Extra Speedy, MS; Film, MS; Iso Speedy, M; Portrait Speedy, M; Anti-Screen, M; Speedy Spec. Rap., M; Ortho Process, M; Wratten—Panchro, MQ; Process Panchro, Q.

WATKINS THERMO PYRO-SODA T. C. 1.9

a. Potassium metabisulphite.....	80 gr.
Pyro.....	160 gr.
Sodium sulphite, dry.....	1 oz.
Water to make.....	10 oz.
b. Sodium carbonate, dry.....	2 oz.
Potassium bromide.....	40 gr.
Water to make.....	10 oz.
MODIFIED THERMO M. Q. T. C. 1.9	
a. Potassium metabisulphite.....	60 gr.
Metol.....	30 gr.
Hydrochinon.....	90 gr.
Water to make.....	20 oz.
b. Sodium sulphite, dry.....	1 oz.
Sodium carbonate, dry.....	1½ oz.
Water to make.....	20 oz.
MODIFIED THERMO D. Q. T. C. 2.6	
a. Potassium metabisulphite.....	60 gr.
Duritol.....	37 gr.
Hydrochinon.....	90 gr.
Water to make.....	20 oz.
b. Sodium sulphite, dry.....	1½ oz.
Sodium carbonate, dry.....	2 oz.
Water to make.....	20 oz.

INSTRUCTIONS.—Look up the Development Speed of the plate or film and mix the developer as directed for that class, USING WATER WHICH HAS STOOD IN THE ROOM LONG ENOUGH TO ATTAIN ROOM TEMPERATURE. In safe ruby light (or total darkness) place the plate in the tray, flow it with developer, cover the tray light-tight, and note the time. We recommend handling plates in total darkness and using white light while they are covered. Now observe the temperature of the room and consult the Table of Temperatures, where the correct time for development will be found opposite the degree and under the Temperature-Coefficient of the developer in use. The tray may be rocked now and then during development, but the plate should not be removed from the solution until the time is up. Then turn out the white light and rinse and fix the plate by safe light or in a covered tank.

If the first trial does not give the right printing quality to suit your requirements, classify the plate one class nearer VS for more or one class farther from VS for less contrast.

DILUTION OF DEVELOPER.—	VVQ	VQ	Q	MQ	M	MS	S	VS
Watkins Thermo Pyro-Soda....	1	1½	1¾	2¼	3	4	5	6¾
Modified Thermo M.-Q.....	1½	2	2¾	3½	4½	6	8	10
Modified Thermo Duratol.....								
drams of each stock to be diluted to make total volume 3 ounces for tray or 10 ounces for tank development.								
Rodinal (Citol, Azol, Certinal) ..	20	26	35	45	60	80	105	135
minims solution to be made up to 3 ounces for tray or 9 ounces for tank. T. C. 1.9.								

Dilution of Dev.	VVQ	VQ	Q	MQ	M	MS	S	VS
Metabisulphite grs.								
Potass.....	1.68							
Metol.....	.84	1.68	3.	4.	5.	6.8	9.	12.
Hydrochinon..	2.52	1.68	3½	2½	3.	3.4	6.8	4½
Sod. Sulphite..	12.5	16½	22.	28.	37.	50.	66.	82.
Sod. Carbonate	18.75	24¾	33.	42.	55.	70.	99.	123.
Water.....	30 ⅓	30 ⅓	30 ⅓	30 ⅓	30 ⅓	30 ⅓	30 ⅓	30 ⅓

*For flashlight pictures equal parts of Hydrochinon and Eikonogen give softer effects.

N.B.—A single portion of developer should be used for only one plate, but the used developer (except pyro) should be saved for paper. If fog occurs, add to each ounce of water used for diluting, 7½ to 10-grs. dry sulphite.



BETSEY.

Edna Leighton Tyler.



TABLE FOR CALCULATING DISTANCES IN ENLARGING OR REDUCING

From The British Journal Photographic Almanac

Focus of Lens	Times of Enlargement and Reduction							
Inches	1 Inch	2 Inch-es	3 Inch-es	4 Inch-es	5 Inch-es	6 Inch-es	7 Inch-es	8 Inch-es
2.....	4 4	6 3	8 $2\frac{2}{3}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{9}{10}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{3}{16}$
3.....	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{4}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{9}{10}$
4.....	8 8	12 6	16 $5\frac{1}{3}$	20 5	24 $4\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{3}{5}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5.....	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $7\frac{1}{3}$	$27\frac{1}{2}$ $6\frac{4}{5}$	33 $6\frac{1}{2}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6.....	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{5}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7.....	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8.....	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9.....	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical center. The use of the table will be seen from the following illustration: A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of 6 inches equivalent focus. He must therefore look for 4 on the upper horizontal line and for 6 on the first vertical column and carry his eye to where these two join, which will be $30\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the center of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times, the same method must be followed; but in this case the greater number will represent the distance between the lens and the picture to be copied, the latter that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be 12 inches, as this number is not in the column of focal lengths, look out for 6 in this column and multiply by 2, and so on with any other numbers.

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS WHEN SHARP FOCUS IS SECURED ON INFINITY

Focal Length of Lens in Inches	Ratio marked on Stops													
	f/4	f/5.6	f/6	f/7	f/8	f/10	f/11	f/15	f/16	f/20	f/22	f/32	f/44	f/64
	Number of feet after which all is in focus													
4	33	24	22	19	17	13	12	9	8	7	6	4	3	2
4¼	38	27	25	21	19	15	14	10	10	7	7	5	3½	2½
4½	42	30	28	24	21	17	15	11	11	8½	7½	5½	4	3
4¾	47	34	31	27	24	19	17	12	12	9½	8½	6	5	3
5	52	36	35	30	26	21	19	14	13	10½	9½	6½	5½	3½
5¼	57	40	38	33	28	23	21	15	14	11½	10½	7	5½	3½
5½	63	45	43	36	31	25	23	17	15	12½	11½	7½	6	4
5¾	68	50	46	38	34	27	25	18	17	13½	13	8½	6½	4
6	75	54	50	42	38	30	28	20	19	15	14	9	7	4½
6¼	81	58	54	46	40	32	29	22	20	16	15	10	7½	5
6½	87	62	58	50	44	35	32	23	22	17½	16	11	8	5½
6¾	94	67	63	54	47	38	34	25	24	19	17	12	8½	6
7	101	72	68	58	51	40	37	27	25	20	18	12½	9	6
7¼	109	78	73	62	54	44	39	29	27	22	20	13½	10	6½
7½	117	83	78	64	58	47	42	31	29	24	21	14½	10½	7
7¾	124	90	83	71	62	50	45	33	31	25	22	15½	11	7½
8	132	96	88	76	68	52	48	36	32	28	24	16	12	8
8¼	141	100	94	80	71	56	51	37	35	29	25	17½	12½	8½
8½	150	104	100	84	76	60	56	40	38	30	27	19	13½	9
8¾	156	111	104	89	78	63	57	42	39	32	29	20	14	10
9	168	120	112	96	84	67	61	45	42	34	31	21	15	10½
9¼	180	127	116	101	90	71	65	47	45	35	32	22	16	11
9½	190	133	125	107	95	75	68	50	47	37	34	24	17	12
9¾	197	141	131	113	99	79	72	52	50	39	36	25	18	12½
10	208	148	140	120	104	83	75	55	52	42	38	26	19	13

If sharp focus is secured on any of the distances shown, then with the stop indicated all objects are in focus from half the distance focused on up to infinity.

LENGTH OF STUDIO REQUIRED FOR LENSES OF DIFFERENT FOCAL LENGTHS FROM 6 TO 8 FEET IS ALLOWED FOR THE CAMERA AND OPERATOR

From "Photographic Lenses" by BECK and ANDREWS

Focus of Lens	Size	Kind of Portrait	Length of Studio	Dist. of Lens from Object
Inches			In Feet	In Feet
6	Carte de Visite 3¼x4¼.....	Full Length	18 to 20	11 to 12
7½	Carte de Visite.....	Full Length	22 to 25	14 to 15
		Full Length	24 to 28	17 to 19
8½	Carte de Visite.....	Bust	10 to 15	5
		Full Length	20 to 23	12 to 13
9½	Cabinet and smaller groups.....	Bust	12 to 17	7
		Full Length	25 to 30	17 to 18
11	Cabinet and 5x7 groups.....	Bust	13 to 20	8
14½	Cabinets, panels and 6½x8½ groups.....	Full Length	32 to 40	23 to 24
		Bust	14 to 20	7
		Full Length	20 to 25	13
19	10x12 portraits or groups.....	Bust	14 to 20	7
		Full Length	25 to 30	14
24	16x20 portraits or groups.....	Bust	14 to 20	8

"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM

$$\frac{f}{1} \quad \text{TO} \quad \frac{f}{100}$$

In the following table Mr. S. A. Warburton calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14.06	58	210.25
$1\frac{1}{4}$	.097	16	16	59	217.56
1.414	$\frac{1}{8}$	17	18.06	60	225.00
$1\frac{1}{2}$	.140	18	20.25	61	232.56
$1\frac{3}{4}$	.191	19	22.56	62	240.25
2	$\frac{1}{4}$	20	25.00	63	248.06
$2\frac{1}{4}$	.316	21	27.56	64	256
$2\frac{1}{2}$	.390	22	30.25	65	264.06
2.828	$\frac{1}{2}$	22.62	32	66	272.25
$2\frac{3}{4}$	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
$3\frac{1}{4}$	.660	25	39.06	69	297.56
$3\frac{1}{2}$	.765	26	42.25	70	306.25
$3\frac{3}{4}$	.878	27	45.56	71	315.06
4	1	28	49.00	72	324.00
$4\frac{1}{4}$	1.12	29	52.56	73	333.06
$4\frac{1}{2}$	1.26	30	56.25	74	342.25
$4\frac{3}{4}$	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
$5\frac{1}{4}$	1.72	33	68.06	77	370.56
$5\frac{1}{2}$	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
$5\frac{3}{4}$	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
$6\frac{1}{4}$	2.44	38	90.25	82	420.25
$6\frac{1}{2}$	2.64	39	95.06	83	430.56
$6\frac{3}{4}$	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
$7\frac{1}{4}$	3.28	42	110.25	86	462.25
$7\frac{1}{2}$	3.51	43	115.56	87	473.06
$7\frac{3}{4}$	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
$8\frac{1}{4}$	4.25	45.25	128	90	506.25
$8\frac{1}{2}$	4.51	46	132.25	90.50	512
$8\frac{3}{4}$	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
$9\frac{1}{4}$	5.34	49	150.06	93	540.56
$9\frac{1}{2}$	5.64	50	156.25	94	552.25
$9\frac{3}{4}$	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625
14	12.25	57	203.06		

American Photographic Societies

This list is compiled from information received from an inquiry form sent to the societies during the latter half of 1921. It includes many societies not given in the 1921 Annual, but falls short of completeness as a record of the photographic societies of America. Secretaries of societies not here listed are urged to send us particulars of their organization so that the list may be fully representative of society activities.—Editor.

- ALLENTOWN CAMERA CLUB—Allentown, Pa. Headquarters, 708 Hamilton St. *President*, George E. Phillips; *Vice-President*, L. H. Cutten; *Secretary*, R. B. Hernandez, 1326 Chew St., Allentown, Pa. Member Associated Camera Clubs of America.
- AMERICAN INSTITUTE PHOTOGRAPHIC SECTION—New York City. Headquarters, 322-324 West 23d Street. Established March 26, 1859. Stated meetings, first and third Mondays of each month. No meetings during Summer months. *Chairman*, Oscar G. Mason; *Vice-Chairman*, Robert A. B. Dayton; *Treasurer*, James Y. Watkins; *Secretary*, John W. Bartlett, M.D., F.R.P.S., 149 West 94th Street.
- ASSOCIATED CAMERA CLUBS OF AMERICA—Headquarters, 878-880 Broad Street, Newark, N. J. *President*, Julius F. Graether, Newark Camera Club; *Secretary*, Louis F. Bucher, Newark Camera Club; *Treasurer*, Henry C. Brewster, Newark Camera Club; *Western Vice-President*, Todd Hazen, Oregon Camera Club; *Southern Vice-President*, George H. Rowe, Photographic Club of Baltimore; *Central Vice-President*, Dr. Maclay Lyon, Kansas City Camera Club; *Eastern Vice-President*, J. L. Hanna, Columbia Photographic Society, Philadelphia. Motive—Closer affiliation of Camera Clubs, Annual Exhibits, Interchanges of Prints and Slides, as well as ideas, and literature. Membership September 1, forty-two clubs. Association organized May 1, 1919.
- BERKSHIRE PHOTOGRAPHIC SOCIETY—Headquarters, care of A. W. Jacobs Studio, 30 North St., Pittsfield, Mass. Member Associated Camera Clubs of America.
- BOULDER CAMERA CLUB—Care of University of Colorado, Boulder, Colo. *President*, Severance Burrage.
- BOSTON CAMERA CLUB—Boston, Mass. Established 1881. Incorporated 1886. Membership, 75. *President*, P. Hubbard; *Secretary*, John H. Thurston, 50 Bromfield Street.
- BOSTON YOUNG MEN'S CHRISTIAN UNION CAMERA CLUB—Boston, Mass. Headquarters, 48 Boylston Street, Boston. Organized, 1908. *President*, Herbert B. Turner; *Vice-President*, Louis Astrella, 26 Quincy Street, Roxbury; *Treasurer*, F. Chester Everett; *Secretary*, Ernest Gustavsen, 234 Hyde Park Ave., Forest Hills. Meetings first Tuesday each month at club rooms, 48 Boylston Street. Member Associated Camera Clubs of America.
- BROOKLYN INSTITUTE OF ARTS AND SCIENCES, PHOTOGRAPHIC SECTION—Headquarters, Academy of Music Building, Lafayette Ave., Brooklyn, N. Y. Organized 1886. Membership 75. Meetings for general discussion and criticism the second Monday each month except July and August. Courses in Rudiments of Photography, Advanced Photography, Pictorial Photography, Loan Exhibitions. Annual exhibit of the Department in May. Demonstrations of the various processes every third Friday evening. *President*, Wm. Elbert Macnaughton; *Vice-President*, Wm. Alexander Alcock; *Secretary*, Sophie Louisa Lauffer, 157 Bainbridge St.; *Treasurer*, J. Halstead Patterson.
- BUFFALO CAMERA CLUB—Buffalo, N. Y. Headquarters, Kinne Building, corner Main and Utica Streets. Annual election of officers, fourth Thursday in April; regular meeting nights, second and fourth Tuesdays of each month. *President*, F. W. Cowell; *Vice-President*, N. G. Sherck; *Secretary*, Charles L. Peck, 1101 Elmwood Avenue. Member Associated Camera Clubs of America.
- CALIFORNIA CAMERA CLUB—San Francisco, Cal. Headquarters, 833 Market St., San Francisco, Cal. Established March 18, 1890. Incorporated April 5, 1890. Membership 437. Date of meeting second Tuesday, monthly.

Monthly print exhibitions and illustrated lectures. *President*, Edward H. Kemp; *Secretary*, Wm. C. Mackintosh. Member of other clubs are cordially invited to visit our rooms when in San Francisco. Member Associated Camera Clubs of America.

CAMERA CLUB OF DETROIT—Headquarters, 7849 Walnut St., Detroit, Mich. *Temporary Chairman*, Orville P. Laughlin.

THE CAMERA CLUB—New York. Headquarters, 121 West 68th St., Established in 1884 and incorporated in 1896 upon consolidation with the New York Camera Club, 121 West 68th St. Membership 245. Annual meeting first Thursday after the first Monday in January. *President*, J. Henry McKinly; *Secretary*, Monroe W. Tingley.

"CAMERADS"—New Brunswick, N. J. Headquarters, corner Church and George Streets. Established April 24, 1890. *Secretary*, Harvey Iredell; D.D.S., Lock Box, 34 New Brunswick.

CAMERA CLUB OF WATERBURY—Waterbury, Conn., P. O. Box 712. Organized Sept. 1919. Meets Monday evenings at the Y. M. C. A. Room 10, 136 West Main St. *President*, Arthur H. Ganung; *Secretary*, Hollis M. French. Member Associated Camera Clubs of America.

CAMERA PICTORIALISTS OF LOS ANGELES—Los Angeles, Cal. Headquarters, Room 31, Walker Auditorium. Association formed for strictly pictorial work; the holding of an annual International Salon; and for the good of the cause generally. Membership limited to twenty. Meeting, first Monday of month. *Director*, Louis Fleckenstein; *Secretary*, Perry N. Moerdyke.

CAPE ANN CAMERA CLUB—Headquarters, Gloucester, Mass.

CAPITAL CAMERA CLUB—Washington, D. C., 638 I Street, N. W. Founded May 1, 1891. Annual meeting, first Thursday in January. *President*, Frederick L. Pittman; *Vice-President*, G. W. Anderson; *Secretary*, George M. Miller, 638 I St., N. W.; *Treasurer*, J. H. Weimer; *Librarian*, Miss Lucy Powell. Date of annual exhibition, March. Member Associated Camera Clubs of America.

CENTRAL Y. M. C. A. CAMERA CLUB—Headquarters, 1421 Arch Street, Philadelphia, Pa. Club organized 23 years ago. Meetings, third Monday in Month. *President*, Bernard B. Wolff; *Vice-Presidents*, Geo. S. Gassner, J. F. Jackson; *Secretary*, S. K. Taylor; *Financial Secretary*, S. R. C. Cooper. Membership, 75.

CHICAGO CAMERA CLUB, Chicago, Ill. Headquarters, 31 W. Lake Street. Established February 14, 1904. Incorporated February 19, 1904. Meetings every Wednesday. *President*, Leroy T. Goble; *Vice-President*, James E. Mead, Jr.; *Secretary*, Alvin R. Born, 7744 Oglesby Ave.; *Treasurer*, Gilbert B. Seehausen. Member Associated Camera Clubs of America.

CHICAGO PHOTO FELLOWS—Chicago, Ill. Organized September 8, 1909. Membership, 8. *Correspondent*, F. M. Tuckerman, 1109 Railway Exchange, Chicago.

CLEVELAND PHOTOGRAPHIC SOCIETY—Cleveland, Ohio. Headquarters, The Towers, 6106½ Euclid Ave. Established June 7, 1913. Permanent organization effected at meeting of June 18. Incorporated October 9, 1920. Meetings every Wednesday. *President*, W. W. Webber; *Vice-President*, C. H. Shipman; *Financial Secretary*, Max E. Reuter; *Corresponding Secretary*, H. G. Cleveland. Member Associated Camera Clubs of America.

COLUMBIA PHOTOGRAPHIC SOCIETY—Philadelphia, Pa. Headquarters, 2526 North Broad Street, Philadelphia. Established 1889. Incorporated July 3, 1894. Membership, 80. Business meeting first Monday of each month; other Mondays, lectures or demonstrations. Member of Associated Camera Clubs of America. *President*, Daniel Fritz; *Vice-President*, Theo. D. Mitchell; *Treasurer*, C. F. Davis, 701 Eldridge Avenue, West Collinswood, N. J.; *Secretary*, A. I. Bond.

DARKROOM CLUB—Milwaukee, Wis. Organized January 1921. Meets every third Friday of each month. Meetings held at home of the president, 730 55th St. *President*, B. C. Demium; *Vice-President*, John H. Becker; *Secretary-Treasurer*, Albert L. Goerlitz, 749 27th Street.

DARTMOUTH CAMERA CLUB—Headquarters, 7-8 Robinson Hall, Hanover, N. H. Organized, 1915. Membership, 30. *President*, A. R. Steiner. All communications addressed to Prof. Leland Griggs, Hanover, N. H. Member Associated Camera Clubs of America.

DALLAS CAMERA CLUB—Dallas, Texas. Organized July 20, 1921. *President*, Jno. R. Minor, Jr.; *Vice-President*, L. B. Eidson; *Secretary*, H. B. Thevenet, Sr.

DETROIT CAMERA CLUB—Detroit, Mich. Headquarters, 32 Adams Ave. West. *Secretary*, Dr. Preston M. Hickey.

ELMIRA CAMERA CLUB—Elmira, N. Y. Headquarters, 116 Baldwin Street, Elmira. Established, 1902. Membership, 30. Meets first Wednesday each

- month. *President*, C. G. Leonardi; *Secretary-Treasurer*, E. Radeker Stancliff, 240 Lake Street. Member Associated Camera Clubs of America.
- ELYSIAN CAMERA CLUB**—307 Washington St., Hoboken, N. J. Established 1902. Date of meeting first Friday of each month. Membership 54 Active, 7 Associate, 8 Honorary. *President*, Albert Harrass; *Vice-President*, Adolph Geiger; *Secretary*, J. Henry Wendt, 805 Washington St., Hoboken, N. J. Member Associated Camera Clubs of America.
- GILD OF PHOTOGRAPHERS OF THE SOCIETY OF ARTS AND CRAFTS OF BOSTON, MASS.**—*Dean*, Herbert B. Turner; *Secretary and Treasurer*, Ralph Osborne; *Councillors*, Miss Lois L. Howe, Alton H. Blackinton. Organized February 18, 1916. Meetings held at members' studios.
- GRAND RAPIDS CAMERA CLUB**—Member Associated Camera Clubs of America. Headquarters, 2 Central Place, where demonstrations and inspiration meetings are held each Thursday evening from September to June inclusive, with occasional field days during the Summer months. *President*, Prof. H. C. Doane; *Vice-President*, J. O. Rogers; *Treasurer*, A. Steenhagen; *Secretary*, Miss Loa G. Winegar. Member Associated Camera Clubs of America.
- INDIANAPOLIS CAMERA CLUB**—Headquarters, 406 Rauh Bldg., Indianapolis. Member Associated Camera Clubs of America.
- INTERNATIONAL PHOTOGRAPHIC ASSOCIATION**—San Francisco, Cal. Founded 1908. *President*, F. B. Hinman, Evergreen, Cal.; *General Secretary*, A. E. Davies, 1327 Grove St., Berkeley, Cal.; *Stereoscopic Album Director*, James B. Warner, 413-415 Claus Spreckels Building, San Francisco, Cal.; *Director Post Card Division*, John Biesman, Hemlock, Ohio; *Director Lantern-Slide Eastern Division*, Arthur H. Farrow, 51 Richelieu Terrace, Newark, N. J.; *Director Lantern-Slide Western Division*, A. E. Davies, 1327 Grove Street, Berkeley, Cal. *State Secretaries*: California—A. E. Davies, 1327 Grove St., Berkeley. Colorado—H. E. High, 1023 Champa St., Denver. Idaho—Eugene Clifford, 902 9th Ave., Lewiston. Iowa—Harry B. Nolte, Algona. Kansas—H. H. Gill, Hays City. Louisiana—Samuel F. Lawrence, 1247 Oakland Street, Shreveport. Mississippi—George W. Askew, Jr., 211 34th Ave., Meridian. Missouri—J. F. Peters, Room 210 Union Station, St. Louis. New York—Louis R. Murray, 927 Ford Street, Ogdensburg. Oregon—F. L. Derby, La Fayette. Texas—Emmett L. Lovett, care Southern Electric Company of Texas, Wichita Falls. *Album Directors*: Alabama—Richard Hines, Jr., Barton Academy Bldg. Mobile. Colorado—O. E. Aultman, Pleased Bldg., Trinidad. Connecticut—Harry E. Carpenter, 389 Remington Ave., Bridgeport. Florida—Capt. E. S. Coutant, Lock Box 73, Stuart. Georgia—L. O. Surles, P. O. Box 434, Cuthbert. Idaho—Eugene Clifford, 902 9th Ave., Lewiston. Illinois—George A. Price, Box 286, Champaign. Iowa—C. W. Parker, Mapleton. Maryland—E. G. Hooper, 218 East 20th Street, Baltimore. Massachusetts—John Mardon, 10 High Street, Boston. Michigan—W. E. Ziegenfuss, M. D., 171 Richton St., Detroit. Minnesota—Leonard A. Williams, 622 2nd Avenue South, St. Cloud. Mississippi—George W. Askew, Jr., 211 34th Ave., Meridian. Missouri—Wharton Schooler, R. F. D. No. 2, Eolia. New York—Charles F. Rice, P. O. Box 517, Mamaroneck. North Dakota—Jas. A. Van Cleef, 619 Second Ave., North Fargo. Ohio—J. H. Winchell, R. F. D. No. 2 Painesville. Pennsylvania—L. A. Sneary, 2822 Espy Ave., Pittsburgh. South Dakota—C. B. Bolles, L. B. 351, Aberdeen. Texas—J. B. Oheim, P. O. Drawer M. Henrietta. Utah—John C. Swenson, A. B. Provo. West Virginia—William E. Monroe, Box 298, Point Pleasant.
- KANSAS CITY CAMERA CLUB**, 1919-1920—Suite 501, Bryant Building, Kansas City, Mo. Organized 1914. Club meets second Monday of each month. Annual Exhibition in November. *President*, Chas. H. Stearns; *Vice-President*, Wm. Pitt; *Secretary-Treasurer*, Dr. Maclay Lyon. Member Associated Camera Clubs of America.
- KODAK PARK CAMERA CLUB**—Kodak Park, Rochester, N. Y. Organized Jan. 6, 1920. Meetings held bi-monthly. *President*, Harris Tuttle; *Vice-President*, W. L. Farley; *Secretary*, Howard A. Sauer, Kodak Park; *Treasurer*, Irwin Ward. Member Associated Camera Clubs of America.
- LOWELL Y. M. C. A. CAMERA CLUB**—Lowell, Mass. *Secretary*, I. C. Shappee.
- MOLINE Y. M. C. A. CAMERA CLUB**—Headquarters, Moline, Ill.
- MONTREAL AMATEUR ATHLETIC ASSOCIATION CAMERA CLUB**—Montreal, Canada. Headquarters, M. A. A. Building, 250 Peel Street. Organized May 1, 1906. *President*, F. H. J. Ruel; *Vice-President*, W. S. Wier; *Hon. Secretary*, Walter G. D. Boronow; *Treasurer*, R. E. Melville. Exhibitions: Annual, April; Local, November.
- NEWARK CAMERA CLUB, INC.**—878-880 Broad Street, Newark, N. J. Organized 1888. Incorporated 1910. Meetings, second and fourth Mondays in each month. Motto, "SOMETHING OF INTEREST EVERY MONDAY NIGHT." *President*, J. Raymond Boyle; *Vice-President*, Lyman Lee;

Secretary, Edwin Wick; *Treasurer*, Henry C. Brewster. Membership now 200 active. Member and organizer of Associated Camera Clubs of America. Visitors Welcome.

NEW BRITAIN CAMERA CLUB—Organized 1892. *President*, W. B. Rossberg; *Vice-President*, H. P. Richards; *Secretary-Treasurer*, Paul A. Stahl, 260 Corbin Avenue, New Britain, Conn. Meets first and third Tuesdays, 173 Main Street. Member Associated Camera Clubs of America.

NEW HAVEN CAMERA CLUB—17 Broadway. Organized 1911. Membership, 35. *President*, Thomas G. Bowers; *Vice-President*, Benjamin H. Walden; *Secretary*, William R. Frisbie, 55 Lyon St., (N. H.); *Treasurer*, J. Geo. Blunden. Meetings held every Thursday. Business meetings, first Thursday in the month. Member Associated Camera Clubs of America.

ONONDAGA PHOTOGRAPHIC CLUB—35-36 Grand Opera House Building, Syracuse, N. Y. Organized 1920. Membership 49. Meetings first and third Fridays in each month. Motto: "A live wire club." *President*, Ralph R. Scobey; *Vice-President*, Wm. J. Chorley; *Secretary*, Prof. Frederick W. Simpson, 529 Garfield Ave.; *Treasurer*, Prof. T. L. Hankinson. Member Associated Camera Clubs of America.

ORANGE CAMERA CLUB—East Orange, N. J. Headquarters, Main and Clinton Streets. Established March 21, 1892. Incorporated May 19, 1893. Membership, 115. Date of meetings, first and third Saturdays of each month, except July, August and September. *President*, Robert M. Crater; *Secretary*, C. Russell Powelson, Main and Clinton Streets, East Orange, N. J. Member Associated Camera Clubs of America.

OREGON CAMERA CLUB—Portland, Oregon. Headquarters, Fifth Floor Elks' Building. Established 1895. Incorporated 1903. Membership, 100. Date of annual meeting, second Tuesday in January. *President*, H. W. Sherrard; *Secretary*, E. C. Churchill. Date of annual exhibit, early in Spring. Member Associated Camera Clubs of America.

PHOTOGRAPHIC CLUB OF BALTIMORE CITY—Baltimore, Md. Headquarters, 329 Park Avenue. Established 1885. Incorporated 1890. Membership, active, 50. Meetings, first Tuesday in month. *President*, A. Gustafson, Baltimore; *Secretary*, A. H. Goldsborough, Baltimore. Member Associated Camera Clubs of America.

PHOTO FELLOWS CLUB—Vancouver, Canada. Headquarters, 650 Granville Street. *Secretary-Treasurer*, Lieut. J. Green, R. N. V. R.

PHOTOGRAPHIC SOCIETY OF PHILADELPHIA—Philadelphia, Pa. Headquarters, 1615-1617 Sansom Street. Established November, 1862. Incorporated April, 24, 1885. Membership, 95. Date of meetings: Members, second Wednesday. *President*, Dr. Collier F. Martin; *Secretary*, E. A. McKinley, 1615 Sansom Street; *Treasurer*, H. F. A. Starr. Date of members' annual exhibition, March. Member Associated Camera Clubs of America.

PICTORIAL PHOTOGRAPHERS OF AMERICA—New York City. Headquarters, National Arts Club, 119 East 19th Street. Meetings first Monday evening in each month from October to June. *President*, Clarence H. White; *Vice-President*, Dr. A. D. Chaffee; *Hon. Vice-Presidents*, Gertrude Kasebier, Prof. Chas. F. Chandler; *Treasurer*, Dr. Chas. H. Jaeger; *Recording Secretary*, Jerry D. Drew; *Corresponding Secretary*, Margaret Watkins. Member Associated Camera Clubs of America.

PITTSBURGH ACADEMY OF SCIENCE AND ART (PHOTOGRAPHIC SECTION)—Pittsburgh, Pa. Headquarters, Carnegie Institute, Schenley Park. Organized January 23, 1900. Membership, 100. Meetings, second and fourth Tuesdays in each month at Carnegie Institute. *President*, O. C. Reiter, 2424 Penn Avenue; *Vice-President*, M. C. Rypinski; *Secretary-Treasurer*, Chas. K. Archer, 1412 Carnegie Bldg., Pittsburgh, Pa.; *Lantern-Slide Director*, P. F. Squier, 483 Campbell Street, Wilkensburg, Pa.; *Print Director*, S. A. Martin, 1011 Heberton Avenue, Annual salon, Carnegie Art Gallery, March. Address all communications to Chas. K. Archer, Secretary, 1412 Carnegie Bldg., Pittsburgh, Pa.

PITTSBURGH PHOTOGRAPHIC SOCIETY—Pittsburgh, Pa. Headquarters, North Side Community House. Established June, 1921. Membership, 25. *President*, Charles W. Douitt; *Secretary*, John Allen; *Treasurer*, M. P. Beers.

PITTSBURGH SALON OF PHOTOGRAPHIC ART—Pittsburgh, Pa. Under auspices of Photographic Section of the Academy of Science and Art. Membership consists of the leading pictorialists in the United States. *President*, O. C. Reiter, 2424 Penn Avenue, Pittsburgh, Pa.; *Secretary*, Charles K. Archer, 1412 Carnegie Bldg., Pittsburgh, Pa. Salon held Carnegie Institute, March. Last day of entry, February 10.

POLYTECHNIC CAMERA CLUB—Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Organized May 15, 1921. Meets second and fourth Tuesdays, 12.30 p. m. *President*, Joseph R. Fisher, 1555 74th St.; *Secretary*, Edward Breiteirser, 2703 Bainbridge Ave., Bronx, N. Y.

- PORTLAND CAMERA CLUB PHOTOGRAPHIC SECTION OF THE PORTLAND SOCIETY OF ART—Portland, Me. Headquarters, L. D. M. Sweat Memorial, Spring, corner High Street. Established 1899. Membership, 86. Date of meetings, every Monday evening. *President*, E. Roy Monroe; *Vice-President*, Roger P. Jordan; *Secretary-Treasurer*, William T. Starr. Date of annual exhibition, in March. Member Associated Camera Clubs of America.
- POSTAL PHOTOGRAPHIC CLUB—Headquarters, Washington, D. C. Established December, 1888. Membership, 40. Date of meetings, no regular meeting. *President*, Charles E. Fairman; *Secretary*, Ernest L. Crandall, 1331 Newton Street, N. E., Brookland, Washington, D. C. Albums circulate among members monthly, except August and September.
- READING CAMERA CLUB—Reading, Pa. Headquarters, 610 Court St. Established 1913. Meetings first and third Thursdays of each month. Quarterly exhibits for members only. Annual exhibit early in March. *President*, H. N. Mucher; *Secretary*, J. Trate Gerhard, 752 9th St. Reading. Member Associated Camera Clubs of America.
- SALT LAKE CITY CAMERA CLUB—Salt Lake City, Utah. *Secretary*, Thomas O. Sherkell.
- SAN DIEGO Y. M. C. A. CAMERA CLUB—San Diego, Cal. Organized January, 1920. *President*, Homer C. Miller; *Vice-President*, Ivor N. Lawson Jr.; *Secretary-Treasurer*, Y. M. C. A., San Diego, Cal.
- SOUTHERN CALIFORNIA CAMERA CLUB—213 Columbia Bldg., 313 W. 3rd St., Los Angeles. Membership 140. *President*, Ralph G. Hawkins; *Vice-President*, Claude Williams; *Secretary*, Frances Purdy. *Board of Governors*, R. M. Weed, Orrie Pauline Close, W. L. Jennings. Member Associated Camera Clubs of America. Send notices public exhibitions, contests and salons.
- ST. LAWRENCE CAMERA CLUB—Ogdensburg, N. Y. Headquarters, 74 Caroline Street. Established 1900. Membership, 10. Date of meetings, at the call of the Secretary. *President*, Arthur L. Jameson; *Secretary*, John N. Brown, 74 Caroline Street.
- ST. LOUIS CAMERA CLUB—St. Lou's, Mo. Organized February 12, 1914. Devoted to the interest and advancement of the art of photography. Meetings every first and third Thursdays at 8 p. m., Barr Branch Library, Jefferson & Lafayette Aves. *President*, Oscar C. Kuehn; *Vice-President*, E. W. Lidaker; *Secretary*, A. W. Prasse, 3149 Shenandoah Avenue, St. Louis. Member Associated Camera Clubs of America.
- TRENTON PHOTOGRAPHIC SOCIETY—Headquarters, 209 East State St., Trenton, N. J.
- UTAH CAMERA CLUB—Salt Lake City, Utah. *President*, Geo. I. Reeves; *Secretary*, Thomas O. Sheckell, 1411 Walker Bank Bldg.
- WASHINGTON Y. M. C. A. CAMERA CLUB—Washington, D. C. Headquarters. Central Y. M. C. A. Building. Membership, 32. *President*, Myron F. Myers; *Secretary*, Miss Elizabeth N. Brownley, 908 Que St., N. W.
- WESLEY CAMERA CLUB—Headquarters, Bell Theatre Building. Organized April 6, 1912. Meeting the first Monday of each month. *President*, W. A. Drewelow; *Vice-President*, Halvor Flom; *Secretary and Treasurer*, Lawrence Burke (Wesley, Iowa).
- WILKES-BARRE CAMERA CLUB—Headquarters, 131 West Main St., Wilkes-Barre, Pa. Member Associated Camera Clubs of America.
- YONKERS CAMERA CLUB—Yonkers, N. Y. Headquarters, Hollywood Inn Building. *President*, W. R. Cronk; *Vice-President*, Wm. Beck; *Secretary*, Elijah F. Munn; *Librarian*, C. B. Carling; *Trustees*, F. W. Woher, Wm. S. Mitchell, Geo. Stengel. Member Associated Camera Clubs of America.

The American Annual of Photography .. 1923

PHOTOGRAPHIC REVIEW OF 1922

By CARROL B. NEBLETTE

N order that the immense amount of work which is now being done on the theory and practice of photography be of service and easily accessible, a catalogue of photographic literature must be started. It is a healthy sign for future progress that the Royal Photographic Society of Great Britain last year began the publication of *Photographic Abstracts* for the express purpose of classifying and recording the progress of photography. At the same time the *La Revue Française de Photographie* began to issue monthly a bibliographical summary of photographic investigation. In this country the Eastman Research Laboratory has for seven years issued for the personal use of its members the *Abstract Bulletin*. Really serious workers who desire to keep in touch with the advance of photography as a science should take one of these publications.

In this connection, mention should also be made of the *Photographic Review* contributed to the pages of *American Photography* by E. J. Wall, F.R.P.S.

The following pages have been written in an attempt to summarize in concise and handy form the more important investigations, inventions, and progress of the year. The author realizes that it is by no means complete. If a complete summary of photographic progress had been attempted perhaps the whole volume might have been required, and a great deal of this would have been of little interest or value to the average worker.

NEW INTRODUCTIONS

During the year a new magazine "Camera" published by A. J. Bucher of Lucerne, Switzerland, has made its appearance. The new magazine, which is in German, contains eight art pages in rotogravure each month, and also scientific communications by leading authorities as Lупpo-Cramer, Konig, etc.

The firm of Dallmeyer has introduced an ultra speed anastigmat working at $F/2.9$ called the Pentac. The front component consists of a bi-convex crown glass of high refractive index and low dispersion cemented to a negative lens of flint glass of lower refractive index. The mid-negative element is bi-concave, and is of flint glass of a lower refractive index than the crown with a dispersion at least equal to that of the other flint glasses. The back element is similar to the front only reversed in position. *Eng. Patent 151,506.*

Paul Rudolph, the designer of the famous Tessar, has calculated an objective which is marketed by Carl Zeiss as the Plasmal. (*Eng. Pat. 161,091.*) Rudolph has claimed greater depth of focus for the same than given by other lenses of similar focal length and aperture, but measurements by W. Zschokke (designer of the Goerz Dagmar) show that the apparent depth is due to chromatic aberration incompletely corrected.

Photo. Ind. 1921, Mar. 30, p. 343.

Taylor, Taylor and Hobson have patented an improved form of the Gauss lens, working at $F/2$, consisting of six components, two of which are collective lenses of dense barium crown, and two compound dispersive components of plano-concave flint cemented to a plano convex lens of barium crown with high refractive index. *Eng. Patent 157,040, 1920.*

The same firm has also patented a modified form of the original Cooke lens working at $F\ 7/7$ which permits of simpler construction, while giving good performance at its opening.

Eng. Pat. 157,037, 1920.

The firm of Dallmeyer have introduced the Dallon telephoto anastigmat working at $F\ 5/6$, and giving a magnification of two times. It may be used on all kinds of cameras, even roll film, and will certainly fill a long felt want for the sport, or naturalist photographer. The prices are remarkably reasonable considering the difficulty of producing lenses of this type.



WINTER SHADOWS.

LOU SWEET.

The firms of Goerz, Zeiss, and others have not been idle, but as their latest introductions have not yet been introduced in this country, I will not take up space with them.

Several new lenses of the soft focus type have been introduced, namely the Bausch & Lomb Plastigmat, the Gundlach Hyperion, the Wolfe Artistic, by Pinkham Smith, the Graf Variable and a modified Verito. It seems like every manufacturer must try his hand at one, and see what he can do. Some of the latest introductions without doubt are superior in many respects to the older ones but a great deal depends on the user, and I have no doubt that many of us older workers will get better results with the old lens to which we are accustomed, than with the newer ones.

Among very fast lenses introduced in this country we should mention the Gundlach Ultrastigmat working at $F/1.9$ made exclusively for motion picture cameras. The Gundlach-Manhattan Optical Co., manufacturers of the famous Turner-Reich lens, have put out their Radiar which is an unsymmetrical anastigmat working at $F/4.5$.

In a paper read by Hermann Kellner at the Boston meeting of the Society of Motion Picture Engineers, in May, 1922, is described a new fast lens, designed especially for motion picture work by the Scientific Bureau of the Bausch & Lomb Optical Company. This lens is an $F/2$ triplet. In spite of this enormous aperture the spherical aberration is corrected as well as in the usual $F/3$ lenses, coma correction excellent and the astigmatism corrected for a field of 30 degrees. This result was obtained by making one of the six surfaces parabolic. The lens represents probably the first successful effort to employ such a surface in a photographic lens.

SENSITOMETRY AND PHOTOMETRY

In a paper before the Royal Photographic Society of Great Britain, Higson describes in detail a method of automatically obtaining the characteristic curve by wedge methods. The plate whose curve is to be found is exposed under the wedge and developed. When dry it is placed at right angles to its original position on the wedge and printed on vigorous gas-light paper. The general shape and character of the curve is shown very well, but the outline is very diffused.

Photo. Journ., Feb. 1921, p. 93.



THE COQUETTE.

ETHEL STANDIFORD-MEHLING.

In an endeavor to explain the principles of sensitometry in a popular manner the editor of the British Journal, Mr. George E. Brown, contributed to that publication an interesting series of articles entitled "The H. & D. Doctrine." Density, opacity and transparency are explained very simply, and the law of constant-density ratios, the characteristic curve, inertia, and gamma treated in a readable yet accurate manner. The papers are a very valuable addition to the literature of the subject.

Brit. Journ. P., pp. 335, 354, 372, 286, 401, 415.

During the year Dr. Eder, of Vienna, has introduced a modified form of the Eder-Hecht Photometer having a double scale. It is a modified form of exposure plate similar to the Chapman Jones plate speed tester. In addition to the exposure wedge there are four narrow strips of red, green, yellow and blue transmitting definite portions of the spectrum. The idea of these strips is, of course, to show the degree of color sensitiveness of the plate.

Photo. Korr., April, 1921, 87. *Amer. Photo.*, July, 1922, 462.

In some investigations on density curves by Arens, he points out that polarization photometers are not accurate unless the negative deposit is neutral, which is almost never the case. Using blue light for illumination, however, the difficulty is avoided, and greater accuracy obtained.

Z. wiss. Photo., July, 1921, p. 28.

The absorption of light by the Goldberg wedge has been investigated by Toy and Ghosh who find that the absorption is nearly constant throughout the spectrum. There is a very slight decrease between the yellow, green and red, and the absorption in the ultra violet increases very rapidly with decreasing wave length. *Phil. Mag.*, Dec., 1920, p. 775.

A registering microphotometer has been constructed by Moll in which the image of an electric light is focussed on a slit which is projected on the plate whose absorption is to be measured. Another objective focusses another image of the slit on another slit behind which is a thermopile connected to a galvanometer. An electric motor revolves a roll of sensitive paper on which the spot from the galvanometer is focussed by which a record of different parts of the negative may be obtained. Very great accuracy is claimed.

Proc. Phys. Soc., June, 1921, p. 207.

A useful table showing the comparative speeds of Watkins,



INTEREST.

F. MILTON ARMERUST.

Wynne, Hurter and Driffield, Eder-Hecht, and Scheiner has been drawn up by L. P. Clerc.

Brit. Journ. Photo. 200, April 7, 1922.

LIGHT FILTERS

The processes involved in light filter making have been described by Mr. Smith, at one time with Wrattan and Wainright, in the *Brit. Journ. Photo.* August 5, 1921, p. 459.

The general theory of light filters is fully discussed from both the historical, and technical standpoints in a paper by G. V. Potapenko translated by Dr. C. E. K. Mees. The classification of filters is discussed from various standpoints and three groups formed into which filters are placed according to their absorption curves: (1) monochromatic filters (2) compensating filters and (3) subtractive filters. The second part discusses three color and compensating filters—their theory and preparation—while the third part describes in detail the manufacture of filters. A very full bibliography is appended. One of the most valuable publications of the year.

Brit. Journal. P., 1921, 507, 522, 534.

The formula for a large number of filters for three color and general orthochromatic photography, together with their spectral properties, has been given in a paper by Charles B. Hodgman. *Brit. Journ. Photo.*, Jan. 6, 1922, p. 6.

COLOR SENSITIZERS

A new green sensitizer Pinaflavol has been introduced by Dr. E. König of the Hoechst Farbwerke. The new dye replaces Auracin G as a sensitizer for spectral green, and has practically no sensitiveness to red, while the green is transmitted from D in the yellow with a maxima at E (530 A.U.). It may be added directly to the emulsion, or applied as a bath at a dilution of 1:50,000. Except for three color work it seems likely that the dye will find its greatest use in connection with other isocyanines. At first it was reported that attempts to combine the two were unsuccessful, but König has stated later that pinaflavol and pinacyanol may be combined. Plates so sensitized require only about half the time through a green filter as a plate sensitized with pinacyanol alone. Eder has examined the dye and reports favorably.

Photo. Rund., 1921, p. 80—*Brit. Journ. Photo.*, 1921.
(*Color supplement*) p. 16—*Photo Rund.*, 1921, 193.



EVENING.

H. K. FREDERICK.

According to Namias the addition of a small amount of boric acid (0.1-0.2 per cent) prevents the formation of fog when sensitizing with pinacyanol and pinachrome. The total sensitivity is somewhat lessened, but the color value is not affected. *Photo. Korrr., March, 1920, p. 113.*

The relations between degree of dyeing, color-sensitizing, and grain size in emulsions has been studied by Dr. Luppó Cramer who remarks that it has not yet been shown why it is that the degree of dyeing of the three silver halides is in opposite order to their aptitude for color-sensitizing. He comes to the conclusion that surface area, or grain size, is the chief factor in determining the degree of dyeing.

Koll. Zeits., Feb., 1921, p. 90.

Methods of sensitizing by bathing form the subject of a paper by Walters and Davis of the Bureau of Standards. Formulæ are given for the use of pinacyanol and pinacyanol-ammonia given together with practical notes on panchromatising by bathing ordinary plates. The use of orthochromatic sensitizers is also mentioned, and the method of hypersensitizing panchromatic plates worked out by Burka and Kiess noted. It was found that washing in water increased the speed of most color-sensitive plates slightly, and only slightly increases the fog, while hyper-sensitizing greatly increases the same. The spectrograph used by the authors is illustrated and described, and spectrographic and sensitometric methods of studying color sensitiveness compared. The paper is illustrated with many spectrographs showing the sensitizing bands of the various dyes, the effect of washing after dyeing, and also the spectral sensitiveness of several commercial plates. It is obtainable from the Supt. of Documents, Washington D. C. for 15 cents. (Specify Bureau of Standards Paper 422.)

Miss F. Hamer, of Cambridge University, has prepared and studied the sensitizing bands of fifteen isometric isocyanines. It would seem that the influence of a given component is due both to its nature and also to its position in the molecule.

Photo. Journ., Jan., 1922, p. 8.

Luppó-Cramer has found that dyes which sensitize silver bromide have a partial desensitizing action on silver iodide. Gelatino-iodide plates bathed in erythrosin, pinacyanol, or rhodamine B, and exposed under a step tablet, showed reversal



EDNA LEIGHTON TYLER.

in the lower densities. Safranine, however, does not act in a similar manner unless bromide is present.

Photo. Korr., Dec., 1921, p. 276.

Stenger has investigated the keeping qualities of commercial panchromatic plates. He points out that stability depends upon the conditions under which plates are stored, and that properly stored plates keep for remarkably long times. Emulsion sensitized plates appear to keep better than those prepared with a dye bath. Plates were exposed behind an Eder-Hecht wedge and developed in Rodinal 1:20. The ages ran from 146 to 235 months, and more than half of the emulsion dyed plates were usable. The color sensitiveness was not appreciably affected except for a slight displacement in the orange. Plates bathed in pinachrome, ethyl red and isocol in 1909 were found utterly useless owing to high fog. *Ammonium bromide* appears to assist in keeping plates free from fog over long periods of time, but the addition of ammonia lessens the stability.

Z. wiss. Photo., April, 1922, p. 246.

While not color sensitizing in the generally accepted sense, the method of preparing plates for the extreme ultra-violet deserves notice. Two new methods have been worked out by J. Duclaux and P. Jaentet, two French workers. The first method consists in the use of a thin film of oil in contact with the emulsion during exposure. This oil does not penetrate gelatine and fluoresces in ultra-violet light. The second method, an ordinary plate, is treated with sulphuric acid to dissolve the gelatine which is washed off in slow moving water, and a thin film of collodion flowed over the plate to keep the silver salts in place during exposure. Plates so prepared are said to be sensitive as far as 1900 A.U.

Journ. de Physique, 1921, 156.

Brit. Journ. Photo., 1921, July 15, 1921, p. 417.

DESENSITIZERS AND DESENSITIZING

Luppo-Cramer has given formulæ for the preparation of a desensitizing developer of the Rodinal type in the British Journal of Photography (June 3, 1921, page 321). The paramidophenol developer is made up as follows: In 125 ccs. of water are dissolved 50 grams potassium metabisulphite, 20 grams paramidophenol hydrochloride and 4 grams potassium bromide. To this is added, taking great care not to overstep the limit, sufficient of a solution made by dissolving 70 grams



DECORATIVE STUDY.

TAIZO KATO.

of caustic soda in 90 ccs, of water to dissolve the precipitate first formed. To each 200 ccs. of the mixture is added 10 ccs. of 1:100 phenosafranine solution. The dye is precipitated forming a turbid mixture which must be shaken up each time before use. For use the developer is diluted with about twenty parts of water. Formula for a glycin-safranine developer is also given. *Focus, Feb. 10, 1921, p. 46.*

Safranine has been suggested as a cheap substitute for Metol in the popular Metol-hydrochinon developer, since experiments by Luppó-Cramer and Ermen have shown that the addition of phenosafranine to a hydrochinon developer causes it to work faster and softer in a manner similar to Metol. Luppó-Cramer recommends the following as a soft fast working developer employing hydrochinon.

1. Water 1000 cc
 Hydrochinon 12 grams
 Sodium sulphite 100 "
 Potassium bromide 1 "
2. Water 800 cc
 Potassium carbonate 50 grams
 Phenosafranine 0.05% 200 cc.

For use take equal parts of 1 and 2.

For Ermen's sensitometric study of the action of safranine on developers, see Brit. Journ. Photo., July 29, 1921, 445.

While phenosafranine may be used for desensitizing Autochromes Lumiere and Seyewetz advise the use of Aurantia, as it tans the film much less than phenosafranine, and does not alter the rate of development so that the tables for the appearance of the image already advised are still accurate. Tables are given showing the variation in the appearance of the image, and in the total time of development with the normal plate, and those desensitized in phenosafranine and also in Aurantia. It is stated that plates sensitized in the latter may be developed at a distance of about 2 feet from an ordinary candle, or one meter (40 inches) from a 16 c.p. bulb covered with five Virida yellow papers. *Brit. Journ. Photo. (Color Supplement) Aug., 1921, page 29.*

Luppó-Cramer also calls attention to the fact that the oxidation products of several developers are desensitizers, and the particular case of amidol has been the subject of a communication by J. G. F. Druce. In discussing the chemistry of



THE PICTURE BOOK.

MERLE BOYER STUDIO.

the subject he points out that it is possible that an iminoquinone substance might be formed having a similar structure to phenosafranine. More work on the products of oxidized amidol must be done before this theory can be proved. Luppocramer explains the same by saying that the developer oxidation products are easily absorbed by silver bromide, and being concentrated on the surface of the grains is able to prevent the splitting-off of halogen even in the presence of a halogen absorbing developer.

Photo. Ind., Oct. 13, 1920, p. 664.
Brit. Journ. Photo., May 19, 1922, 296.

The spectral sensitiveness of orthochromatic and panchromatic plates desensitized with phenosafranine has been investigated by C. Bonacini who comes to the conclusion that the action is selective and greatest in the regions in which the added sensitiveness is due to the dye used for sensitizing.

Prog. foto., Aug., 1921, p. 210.

Desensitizing by Freud's method using potassium iodide has been brought forward by Bolas. In this process, which was patented in Germany 1908, the plate is immersed in a 4 per cent solution of pure potassium iodide for several minutes, and may then be developed in a brighter light than ordinary. The method and theory were severely criticised later by Bloch and Renwick, who are of the opinion that the method is not satisfactory in practice, and that the explanation of the process given rests on slender foundations. If it is satisfactory in practice there is little likelihood that it will ever be used, owing to the greater efficiency of phenosafranine.

Brit. Journ. Photo., Sept. 9, 1921, 532, *ibid.*, Oct. 21, 1921, 627.

Concerning the recommendation of Aurantia by Lumière and Seyewetz, Luppocramer has shown that it is much less effective than phenosafranine, and only suitable for slow emulsions like the Autochrom. *Photo. Rund.* 1921, 255.

A single solution of Metol-hydrochinon-safranine developer kept in a partly filled, colorless and corked bottle in bright light was found unaltered after seven months. As neither the desensitizing, nor developing, powers had materially lessened, there need be no fear of (at least with M-H developers) stock developers containing safranine deteriorating more rapidly than those not containing the same.

Photo. Korr., June, 1921, 148.



PROFILE STUDY.

John Howard Paine.

Very little work appears to have been done on the theory of desensitizing during the past year. Luppó-Cramer has again brought forward his oxidation theory, but this seems untenable in view of the fact that Lumière and Seyewetz have shown that the original sensitiveness is restored upon complete washing out of the dye, and the latent image is not destroyed.

Photo. Ind., March 30, 1921, 259.

Sensitometric investigations on the effect of desensitizers on the characteristic curve show that developers containing safranine tend to give more contrast and show effects of over exposure. This is considered to be due to the developer acting at a greater depth in the film. Hydrochinon is an exception, and the addition of safranine to it lessens contrasts as has been shown by Luppó-Cramer and Ermen. (See above.)

Prog. foto., Nov., 1921, p. 287.

Two new desensitizers have been introduced by König, of Höchst. They have been labelled "Pinakryptol" and "Pinakryptol Green." The first is colored, but non-staining, while the second is both colorless and non-staining, and in these respects both offer a great advantage over phenosafranine whose tendency to stain has prevented its more widespread use. In a review of the same in the British Journal, R. E. Crowther states that the first is $1\frac{1}{2}$ times more efficient for the blue, and $2\frac{1}{2}$ times for the red as phenosafranine. The desensitizing action of the second dye is even more marked, and is very much more effective than phenosafranine. The speed of development is unaltered with the latter, but Pinakryptol increases the time required by about 25 to 30 per cent.

Brit. Journ. Photo., June 16, 1922, p. 352.

PHOTOCHEMISTRY

F. Schanz after a series of experiments on the action of light on albumin repeats his suggestion that the sensitive substance in photographic emulsions is the colloid vehicle rather than the silver salt. It has long been known that gelatine acts as a sensitizer owing to the formation of some undetermined complex with the silver salt, but so far as the writer is aware this is the first case in which an investigator has come to the conclusion that the colloid itself is the light-sensitive substance rather than the silver salt.

Photo. Korr., Jan., 1921, p. 8.

The photochemical reaction of hydrogen and chlorine is

the subject of a paper by Baly and Barker. The rate of formation of hydrochloric acid is slow at first and rapidly increases to a maximum which is not proportional to the intensity of light. Chlorine expands under illumination, not according to the intensity of light, but to the rate of the reaction.

J. Chem. Society (London), May 1921, p. 653.

The photochemical decomposition of silver bromide was followed by measuring the bromine liberated from precipitated bromide under the action of various intensities of light. The curves obtained by plotting the amount of bromine liberated against the log. exposure are rather similar to the H. & D. characteristic curve. A supplementary exposure beforehand was found to have an accelerating effect.

Berichte der deutschen chemischen Gesellschaft, Sept., 1921, p. 2111.

Renwick's theory of the latent image has been criticised by both Luppó-Cramer and S. E. Sheppard. They consider that the photoelectric discharge of negative electrons from colloidal silver is improbable. Sheppard's criticism is found in the British Journal of Photography 1921 p. 4, while Luppó-Cramer's paper is to be found in Photo. Korrespondenz 1920, 259 and 285.

THE SILVER GRAIN OF EMULSIONS

Despite the fact that most investigations on emulsions are carefully guarded by the manufacturers, an immense volume of work on the theory of the silver grain has been published in the past year. The monograph by Trivelli and Sheppard published by the Eastman Research Laboratory last year has probably acted as an accelerating influence, and it is certain that investigations on the role of the silver grains of sensitive emulsions will occupy a large place in future photographic literature.

Svedberg and Anderson have succeeded in preparing plates having only a single layer of grains, and in measuring the variation of their blackening with exposure. The curve obtained is practically identical with the characteristic curve of a plate, and they come to the conclusion that the variation in the intensity of light cannot be the cause of the characteristic curve. Measurements show that with each size of grain there is a definite characteristic curve, and that sensitiveness increases with the size of grain. *Photo. Journal, August, 1921, p. 325.*



WINTER.

H. V. SCHIEREN.

In commenting on the above paper Renwick is of the opinion that grain size and sensitiveness are not interdependent, and that the properties of an emulsion are probably completely determined in mixing. He points out that there may be an error in the results obtained by Svedberg due to fog producing when dissolving the emulsion, and also to the incomplete development of some grains which would cause them to leave deposits of smaller size. *Photo. Journal, August, 1921, p. 333.*

Sensitivity has been defined by Toy as the minimum exposure necessary to make one crystal developable. The sensitiveness of an emulsion consisting of a single layer of grains may be found by plotting the percentage of grains changed against the log. exposure. The curve so obtained is of the regular type, and he comes to the conclusion that grains of the same size are not all equally sensitive to light. He suggests that the variations are caused by variation in the composition of the crystals, and irregularity in the distribution of energy absorbed by the crystal during exposure.

Photo. Journ., December, 1921, p. 417.

The rate of darkening has been studied by means of photomicrography and Brooksbank comes to the conclusion that grains of all sizes are capable of darkening, and that grains of the same size and structure are not equally sensitive, as darkening does not take place at the same rate in each.

Photo. Journ., December, 1921, p. 421.

The second part of the paper by Weightman and Sheppard, of the Eastman Research Laboratory, dealing with the size and frequency of silver halide in emulsions has been published. Sedimentation and microscopical methods are given for determining the size and frequency. The size-frequency curve of a high speed emulsion was plotted from data obtained by the latter method.

J. Phys. Chem., October, 1921, p. 561.

Svedberg has continued his investigations on the relation between sensitiveness and size of grain in emulsions, and an account of further researches on the subject will be found in The Photographic Journal for April 1922, p. 186. He considers the latent image to consist of small centers scattered through the emulsion, and that a grain will become developable upon exposure only if it has one such center. From this



ADORATION.

CHAS. L. SNYDER.

a probability expression is determined which agrees very well with other observations on the developability of grains of different sizes after exposure to light.

Svedberg also comes to the conclusion that there is no transport of silver from exposed to unexposed grains.

Photo. Journ., April, 1922, p. 183.

DEVELOPERS AND DEVELOPMENT

Alfred Watkins has explained in detail the method used by him in determining the developing speeds of plates for the Watkins speed card. The standard Watkins Thermo M-Q is used at 60 degrees F, and the time required to produce a gamma of 0.9 determined. Tables and calculators for calculating times of development and temperature coefficients are given. *British Journ. Photo., July 1, 1921, p. 383.*

M. Delipino has given a formula for Amidol with bisulphite lye to secure the characteristic depth development. The formula consists of 0.5 per cent Amidol, and from 2 to 5 per cent sodium bisulphite lye with a few drops of 20 per cent sodium sulphite solution. *Corr. foto., Oct., 1920, p. 3643.*

"The State of Our Knowledge of Organic Photographic Developers" was the subject of a paper by A. Seyewetz, of the firm of A. & L. Lumière, to the French Photographic Society. The paper contained considerable information in a condensed form regarding the structure of organic developing agents. Should be read in connection with Wein's Organic Photographic Developers, or Photo Miniature 167 Modern Developers. *Bull. soc. fran. photo., June, 1921, p. 129.*

The firm of A. & L. Lumière have introduced a developer, Chloranol, which is said to be the equi-molecular combination of monomethyl paraamidophenol (Metol base) and monochlorohydroquinone (Adurol). It is, therefore, somewhat similar to their Metoquinone which is prepared by the Molecular combination of Metol and Hydrochinon. Chloranol is similar to Amidol in that it can be used with or without an alkali which is advised only for very short exposures. Its keeping quality is better than Amidol. It has also been recommended for combined fixing and developing.

Photo. Korr., Jan., 1921, p. 26.

The restraining action of borax on development was investi-



FISHING VILLAGE.

EUGENE P. HENRY.

gated last year by E. R. Bullock of the Eastman Research Laboratory. Its action was originally observed by Luppocramer who attributed it to the formation of a less soluble silver salt, and therefore similar to the action of the potassium bromide commonly used. Bullock finds that the action is greatest with a hydrochinon caustic developer. He disagrees with the theory advanced by Luppocramer, and states that the action is more easily explained by the fact that borax and similar salts while giving an alkaline reaction when dissolved in water, yet have the property of making a strongly alkaline solution less alkaline. Therefore the effect of adding borax to a caustic soda developer is to reduce the alkalinity and consequently lessen the rate of development. It is added that identical results so far as fine grain is concerned may be secured with a low alkalinity of sodium carbonate as with the borax formula recommended by Wellington and Ward and others.

Photo. Journ. America, Oct., 1921, p. 387.

Brit. Journ. Photo., Oct. 28, 1921, p. 639.

Amidol is admittedly one of the finest developers, especially for bromide papers, but has not come into universal use, owing to the fact that it will not keep in solution, and a new batch must be made up very shortly before use. The addition of various stabilising substances has been advised by various authorities in order to overcome this defect and enable the developer to be kept as a stock solution. Bunel recommends the addition of lactic acid (1 dram to 25 ounces) for this purpose, while another French worker Desalme advises the addition of stannous tartrate. He gives the following directions for the preparation of the particular form of double sodastannous tartrate which he recommends: Dissolve 10 grams crystallised stannous chloride and 15 grams powdered tartrate acid in 50 cubic centimeters of boiling water. After cooling pour into a cold solution of 2 grams dry sodium carbonate and 250 grams of water. Stir constantly while mixing the two solutions. Make up the total volume to 400 ccs. filter and let stand for twelve hours. For use take 40 cc to each 1,000 cc of developer. Sufficient sodium bisulphite must also be added to neutralize the alkali and prevent fog. L. P. Clerc commenting on the above remarks that his own experiments have not met with complete success. At any rate it seems that glycollic acid as advised by a contributor "Thermit" in the



BUCKING THE TIDE.

August Krug.

B. J. is both simpler and more effective. The formula recommended is:

Sodium sulphite (dry)	2½ Ozs.
Amidol	200 grains
Potassium Bromide	10 “
Glycollic acid	10 “
Water	75 Ozs.

A quart bottle of the above after standing a week developed 600 square inches of prints without noticeable loss in print quality. *Brit. Journ. Photo., 1921, 356.*

Druce in a review of other work in the same line points out that Amidol prepared from dinitrophenol by reduction with tin and hydrochloric acid may contain very small quantities of tin chloride which acts as a stabiliser as pointed out by Desalme. The process has been protected by a patent (British Provisional Specification No. 2,070). Amidol so prepared contains stannochloride in small quantities, and has excellent keeping qualities.

Brit. Journ. Photo., 1922, 81.

The theory of development has been investigated by M. Volmer who concludes that light alters the position of the silver atoms, or the position of individual electrons, while the atoms themselves are displaced according to the alteration in the energy. A catalytic theory of development is advanced in that the author believes development to be a slow reaction normally, but becomes rapid when silver grains in the emulsion have been affected by light.

Z. wiss. Photo., 1921, 189. Photo. Korr., Oct., 1921, p. 226.

The conditions which affect the activity of several developers is the subject of a paper by Ermen. The effect of bromide on the time of appearance and depression of density was examined as was also the effect of varying amounts of alkali. Amidophenol developers develop without alkali, but more strongly with it, but no increase of activity is secured, above five times normal carbonate. Hydrochinon requires at least N/10 to develop efficiently. Safranine causes Hydrochinon to work faster, but does not appreciably affect Pyro or Metol-hydrochinon. *Photo. Journ. March, 1922, p. 123.*

PRINTING PROCESSES

From the practical standpoint perhaps the most valuable articles of the year concerning printing processes have been those by Dr. B. T. J. Glover on factorial development of bromide papers, and the contrast rating and sensitometric properties of the same. Glover has previously pointed out (*Brit. Journ. Photo* August 26, 1921-503 and Sept. 2nd. 519) that in bromide printing there are two variables, namely exposure and development. It is generally recognised that the two are interdependent and that provided one can be accurately determined the other is readily adjusted. Dr. Glover proceeds to show that the use of the factorial method of development will guide the worker as regards both exposure and development. Each and every developer has its own factor which is probably independent of the paper. This factor should give the longest development allowable without danger of stain or fog, for by so doing the maximum quality of the paper may be obtained. Correct exposure is then defined as that exposure which when developed in a developer to the proper factor gives a print of the desired depth.

Dr. Glover gives the following factors for several popular formulas for bromide paper developers:

Amidol (Kodak formula)	12
Wellington Amidol formula	8
“ Metol-hydrochinon	6
Tabloid Rytol normal strength	6
Azol or Rodinal (1-30)	15

Brit. Journ. Photo., 1921, Feb. 11, p. 87.

J. R. Hall has set forth the need for a numerical expression of contrast for the many grades of paper in use instead of the meaningless terms hard, soft, normal, vigorous, etc., now in common use. He points out that such markings give the user no accurate idea of the contrast of a paper as a paper marked hard by one manufacturer may have no more contrast than that of another maker marked normal.

Brit. Journ. Photo., 1921, July, p. 407.

H. Taylor supporting Hall's suggestion concerning the numerical representation of contrast suggests that the ratio between the exposure producing the deepest black which the



WILLIAM SHEWELL ELLIS.

paper will give, and that which gives the faintest indication of an image, be taken as the contrast range of the paper.

Brit. Journ. Photo., Aug. 19, 1921, 499.

Dr. Glover replying to Hall and Taylor states that the contrast scale of a paper depends on a number of factors, and is not as simple as supposed. The factors which must be considered in formulating the numerical contrast of a paper are gamma, exposure scale, maximum black which the paper will give, and the shape of the characteristic curve. He also states that in his opinion the numerical statement of the contrast scale of a paper will be of little service to the user, and that the same purpose will be best served by a set of prints on the various papers from different negatives.

Brit. Journ. Photo., Nov. 18, 1921, p. 694.

The Carbro process—carbon prints from bromides—is attracting a great deal of attention in England where it appears that several professionals are using it in their studios. It has been still further simplified by F. Garon, and all tissues now require the same time for sensitizing in the new bath which he has worked out. The Carbro process deserves more attention than it seems to have received in this country. It retains every advantage of carbon printing with the added ones of enabling printing to be done without daylight, while large prints in any of thirty different colors may be made without making an enlarged negative. George Murphy Inc., New York, who are agents for the Autotype Company of England, furnish all supplies needed for the process, and also instruction booklets. Garon's formula and procedure have also been published in the British Journal. *Loc. cit., June 3, 1921, p. 327.*

In the course of some notes on the Carbro process A. H. Hall states that for best results from developing papers of the warm black variety the prints should be sepia toned by the sulphide method before use. Better quality is claimed for the Carbros so produced. It is also stated that the Carbro sensitizer leaves the print in capital condition for pigmenting.

Brit. Journ. Photo., Apr. 14, 1922, p. 211.

C. Puyo, the famous French pictorialist, is the author of a series of excellent articles on the oil pigment process in *Revue Française Photographie* April 1 and 15th, 1922, pages 73 and 88.

Self-toning papers, their history, manufacture and manipu-



JOHN M. WHITEHEAD.

lation, was the subject of a paper before the London South Suburban Photographic Society by P. R. Salmon. Reprinted in the *British Journal*. Dec. 9, 1921, pp. 730.

Formula for albumen, gelatine, collodion and plain papers and theirs manipulation are given in a series of articles in *Photo-Era* by C. E. Mullin.

Photo-Era, 1922, Jan., p. 30; Feb., p. 92; Mar., p. 138; Apr., p. 204.

A collection of formula for the toning of gaslight and bromide papers in a variety of colors was published by J. Thompson in *American Photography* for July 1921.

Some interesting observations on the causes of variation in tone by sulphide toning is the subject of a communication from the Eastman Research Laboratory by E. R. Bullock.

Brit. Journ. Photo., July, 29, p. 447.

With this our survey of photographic progress in 1921 must be brought to a close. The field of photography is becoming so broad that it is impossible for any single worker to keep in touch with its progress in all lines even of importance in ordinary work; it, however, the imperfect sketch which the writer has brought together will assist the readers of the *Annual* in locating published matter which will be of service to them in making their hobby more enjoyable, or their profits greater, he will feel amply repaid for the trouble involved in its compilation.



WINTER SHADOWS.

G. P. KIMBERLY.



BLOWING BUBBLES.

GILL & SON.

CARBON AND CARBRO FOR PORTRAITURE

By PAUL L. ANDERSON

T should be understood at the outset that carbon and its closely related form, carbro, are not the ideal mediums when a high-keyed result is desired, or when a pure matt surface is to be secured. It is, to be sure, possible to achieve a lustreless surface by the use of carefully made home-prepared transfer paper, used in conjunction with the mezzotint tissues; and it is possible to get high-keyed prints of a fine quality if sufficient care be taken in the manipulation. But carbon normally tends to give a slight tone throughout, and to give a greater or less degree of lustre, at all events in the shadows, so the worker who desires results of the character indicated will do well to resort directly to platinum, thereby securing the effects he wants with the minimum of trouble.

Fortunately, however, so far as portraiture is concerned, we seldom want very high-keyed prints or absolutely pure high lights, nor is a slight amount of lustre undesirable, so that the many advantages of carbon and carbro recommend these processes for such work.

To take up the specific merits of carbon for portrait work, we find first that almost any quality and color of support may be employed. This is of greater importance than might at first appear, since the intrinsic beauty of a photograph depends to no small extent upon the superficial texture of the print, and the choice of a suitable paper has much to do with the final effect. Also, the color of the support plays no small part; it is the function of all graphic art, and particularly of so literal an art as photography, to produce an illusion of reality, and it will be evident that this illusion—of greater consequence in portraiture than in landscape or genre—is more likely to result if a warm-toned support be used, since the normal color of the human skin is yellowish. A blue-white or a neutral white in the high lights is not nearly so satisfactory for portraits.



LOUIS ASTRELLA.

John H. Garo.

We find, also, that a very wide range of colors is available for the image—some forty or more. It is true that in the best portraiture our choice is limited to some five or six tissues—red chalk, one or two browns, and as many blacks—since the colder colors, together with the more violent ones such as green and purple, are best avoided, even red chalk being used mainly as a foundation in multiple printing. Even so, effects may be obtained which are quite impossible in any other medium except gum, and the laborious character of gum, together with the difficulty of repeating a success, renders it less desirable than carbon for this purpose.

One of the most illustrious, if not, indeed, the greatest of all portrait painters, Rembrandt, is noted—among other things—for the richness and depth of his shadows, and for the manner in which the light grades off into dark. This effect, still of incalculable value in portraits of men and women of strong character, may readily be secured through multiple printing, being easier in carbon than in any other medium except carbro, in which latter it is, in fact, no more difficult or laborious to make a multiple print than to make two single prints. The use of multiple printing has a further advantage in adding a quality which cannot be secured in a single print, for if we use a rather soft negative and build up to the desired depth and contrast through several layers of gelatine and pigment we get an effect comparable to that secured by painting with repeated glazes of transparent color, that is, a sense of looking through, rather than at, the image. This gives a richness which no matt-surface print can ever possess.

It is easier to introduce local modifications in carbon than in any other medium except gum and oil, and if the Garon method of sensitizing for carbro be followed modifications of total contrast are far easier than in any other medium.

Two further advantages which are found in carbro, and are of no slight importance to the average amateur, are that no daylight is needed, all operations being purely chemical; and that prints of any size may be made from a bromide print, thus avoiding the need of a large negative, with the additional chances for failure introduced by the operation of making such a plate.

When it comes to the actual work of printing in carbon, the present writer favors home-made transfer paper over the

commercial, partly because of the wider range of choice thus offered, and partly because the gelatine coating can be more accurately adapted to the result desired. In the writer's book, "Pictorial Photography, Its Principles and Practice," instructions are given for making transfer paper, and we may divide such papers into two broad classes, (1) that in which a relatively light coating of gelatine is applied, in order to secure matt-surface prints, and (2) that in which the coating is relatively heavy, the purpose being to secure a rich quality in the finished picture. By using a moderately rough charcoal paper, giving as light a coat of gelatine as would suffice to hold the tissue, and printing light, in ivory black, the writer has secured prints hardly to be distinguished from hand-sensitized platinum, though such work is rather outside the *genre* of carbon. Incidentally, attention may be called to the fact that ivory black is an exceedingly nice tissue to work with; being rather a weak color, more of the pigment is necessary to give a satisfactory depth, and the result is a very long scale tissue, with more tendency to lustreless effects than is found in most. It is probably the most advantageous of them all when high-keyed effects are desired. For strong prints, as has been indicated, a rather heavy coat of gelatine on the transfer paper is desired, but whether light or heavy, it is well to choose as stout and tough a paper as can be secured, the better to withstand the handling and the hot water of development; this is particularly important if several printings are to be given, and in the latter event it is well to use a heavy card, since a paper is apt to buckle from the drawing effect of multiple coatings of gelatine of varying thickness, in the lights and shadows of the picture. The writer has found the papers and cards of the Strathmore series very satisfactory, also the heavy buff cards of Eaton, Crane and Pike; all of these cards are stout and durable, and do not separate into their several layers on repeated soaking in hot water.

Turning now to the carbro process (the name is evidently a compound of the first syllables of "carbon" and "bromide") the writer favors this very emphatically over straight carbon. Briefly described, it is as follows.

A bromide or gaslight print is made, preferably on a heavy, platino-matt paper, taking care that the high lights are not



MARINE VISTA.

G. W. HARTING.

clogged, and that the print is allowed to develop for one or two minutes after development has apparently ceased. This print, of course, may be either a contact print or an enlargement. After fixing, washing, and drying, the bromide is soaked in cold water until thoroughly limp, and a sheet of sensitized carbon tissue is squeegeed face down on the bromide, which should have been printed with a white margin to act as a safe-edge. The bromide, with the adhering carbon tissue, is placed under pressure between sheets of glass, with a blotter over the carbon, and is allowed to remain for from twelve to twenty minutes; the exact time is not important, provided it falls within these limits.

This constitutes the printing of the carbon tissue, the reaction between the sensitizer and the silver image of the bromide having the same effect on the gelatine as the reaction between the sensitizer and light in ordinary carbon work. When printing is complete, the carbon tissue may either be stripped from the bromide and squeegeed to a sheet of transfer paper, being left under pressure and later developed as in ordinary carbon work, or it may be developed on the bromide, thus superposing a carbon print on the bromide print. If the former course is adopted the bromide may either be thrown away, or it may be redeveloped in any ordinary developer (no fixing being necessary) and made the basis for further carbros; since contact with the sensitizer bleaches the silver image. If the latter course is followed we may either fix out the silver image with Farmer's Reducer, thus leaving a pure carbon print; or we may redevelop it to a sepia with sodium or barium sulphide, thus obtaining an underlying warm image under the carbon; or we may redevelop it to a black with any ordinary developer, this last course making it possible to go on with multiple printing on the same bromide.

Multiple printing by the non-transfer method is ridiculously easy, for whereas registration marks on bromide and transfer paper are necessary in the transfer method, no such precautions are required in non-transfer; the second sheet of sensitized tissue is squeegeed down on the redeveloped bromide, and the silver image itself takes care of registration. The writer has never put more than three printings of carbon on one bromide, but there seems no reason why an indefinite



CHARLES L. PECK.

number should not be applied if necessary; however, three will generally take care of any desired effect.

The advantages of carbro as compared to carbon (in addition to the ones already mentioned, of workability in any light and of the avoidance of large negatives) are that there is no deterioration of the sensitized tissue, that there is no continuing action, and that it is vastly easier to control. The only disadvantage that the writer has discovered is that in the transfer method there is a slightly greater tendency to frilling, but this is by no means serious. It is worth noting that in carbro, whether transfer or non-transfer, there is no reversal of the image from right to left, as in single-transfer carbon.

There are two methods of sensitizing, that worked out by Mr. Farmer, and that due to Mr. Garon. The former has been worked out in greater detail, to give normal results with all the different tissues, but the writer prefers the latter, as offering greater flexibility. A description follows.

Make up two stock solutions, (A) and (B).

(A) Water	20 ounces
Potassium bichromate	480 grains
Potassium ferricyanide	480 grains
Potassium bromide	480 grains

For use take (A) 1 ounce, water 3 ounces.

(B) Acetic acid, glacial	1 ounce
Hydrochloric acid, C. P.	1 ounce
Formaldehyde 40%	22 ounces

For use take (B) 1 ounce, water 23 ounces.

The carbon tissue is immersed for three minutes in the dilute (A) solution, drained for fifteen seconds, and immersed for the proper length of time in the dilute (B) solution, a shorter immersion giving stronger prints, longer immersion giving weaker ones. The proper time in (B) will depend on the tissue used, on the quality of the bromide, on the bromide paper used, and on the result desired; the worker must determine for himself what he will do in any given case. As a basis for trial, the writer would suggest twenty to thirty seconds. An idea of the degree of control afforded by this means may be gained from an example from the writer's own work. Starting with two identical bromide prints, two carbons were made, each piece of tissue having the standard three



GOOD CHEER WITHIN.

EDWIN B. COLLINS.

minutes in (A), but one having ten seconds in (B), the other ninety seconds. The first print was a normal carbon, reproducing the bromide faithfully; the second, although complete in detail and gradation, was a mere ghost so far as contrast is concerned, resembling more than anything else an undeveloped platinum print. It will be seen from this that the range of control in carbros far surpasses anything possible in straight carbon.

The worker will, of course, determine for himself precisely the color or colors of tissue which he will use in any given case, but as a general suggestion, which the writer has found useful, we may indicate that for high-keyed prints on a white stock ivory black is exceedingly good; while for full-scale effects a buff support, with a light printing of red chalk followed by a fairly strong one of ivory black, will give great richness and quality. In the latter case a second printing of standard brown, either with or without a third of ivory black, will give a depth quite foreign to the red chalk; indeed, the red chalk should in general be employed merely to give an underlying warmth, and should be in no way prominent. Or the red chalk may be omitted, and the first printing consist of standard brown, with a light over-printing of ivory black to add vigor. These, of course, are merely suggestions; the various effects obtainable through different combinations of tissues should be worked out by the photographer himself, modifying the printing depths, and using various qualities of negative; only thus can the worker have at command the great possibilities inherent in the process.

To summarize, then, carbon, which includes carbros, presents the following advantages over other mediums for portrait work.

It offers almost unlimited choice of color and texture of support; it offers a wide range of colors; through multiple printing it offers a richness and depth, a quality, not found in any other medium except multiple gum and oil; it offers the opportunity of introducing slight local modifications; it offers the opportunity of great modifications of total contrast; it offers, through multiple printing, a quality of verisimilitude (by means of color combinations) rivalled only in multiple gum; it eliminates the need of daylight for printing; it makes possible the production of large prints without the intervention



WEST WIND.

G. H. S. HARDING.

of a large negative; and it is possible, though not easy, to produce high-keyed prints of a fine and delicate quality.

It is true that in some aspects and for some purposes oil (especially bromoil) and platinum surpass carbon and carbro, but for the general use the writer does not know of any other medium owning so many advantages as the one under discussion. The writer's own preference, for his personal use, is bromoil, but not many workers will voluntarily limit themselves to one print from a negative, and the possibilities of duplication are far greater in carbon than in oil or bromoil; the writer rarely wishes to make more than one print of any subject, so duplication is of little importance to him, and it must be added that the degree of technical skill required for successful oil and bromoil work is much higher than that needed for carbon.

In brief, then, to all those workers in portraiture who are seeking for a fine medium that will combine ease of manipulation with a high degree of that elusive factor known as quality, the writer can confidently recommend the carbon and carbro processes, feeling sure that they will find therein a solution for the greater part of their problems.



E. J. BROWN.



THE BREAKERS ROAR.

WILLIAM S. DAVIS.

BROMOIL DIFFICULTIES

By CHAS. H. PARTINGTON

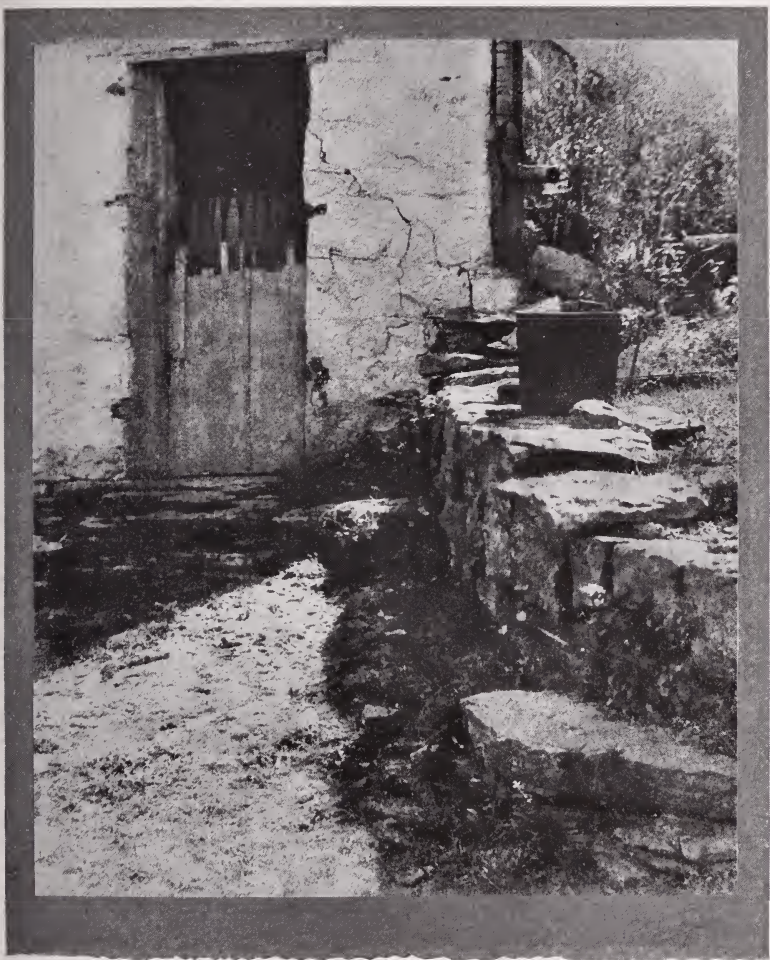


IN writing on the bromoil process for last year's *Annual* efforts were directed toward a complete outline of the work in order to favor the beginner as much as possible. Formulæ for all the operations as well as details of procedure were given, all being based on the methods used by the writer with great success up to that time.

Since writing the preceding article and continuing the bromoil work, difficulties appeared which were very puzzling at first until the foundation, but not the cause, was determined. The process to-day is still considered a most beautiful one, and I intend to use it at all times for pictorial work, even though things do not run perfectly smooth.

Up to the former writing no difficulty had appeared, and the making of a bromoil was simplicity itself. It was hardly possible to produce a poor result, even through error in the various chemical manipulations. Carrying on each operation in the usual manner produced the results until the inking of the first of a set of four prints which ended in a complete failure. The balance of three produced like results, but my only thought was that some part of the work had been slighted. Another set of prints were made, care taken to see that each operation was properly handled, and all solutions correct in composition. Flat failures in the form of the print refusing to ink on this second set started an investigation.

The first fact that presented itself after consideration of the trouble was that a new batch of paper was being used but which was P. M. C. No. 8, the same as the former lot. Knowing that some P. M. C. No. 3 had also been used successfully, and having a few sheets left, prints were made from this and also the new No. 8. Both papers were handled throughout at the same time in the same solutions with the result of perfect bromoils on the No. 3 and failures on the new No. 8. This experiment settled the fact that the new paper differed greatly from the old, and if any success was to be expected it must be treated differently.



Illustrating article "Bromoil Difficulties," by Chas. H. Partington.

Determined to sift the matter down, the supply houses were visited, and an attempt made to procure No. 8 paper of the same emulsion as my first lot, but none could be located. An examination of the wrapper disclosed the original batch to have been over six months past the expiration date, while the No. 3 was almost as bad. This discovery led to a search for old paper and resulted in locating one dozen Standard "B" stock which is very light weight, and has a smooth surface ordinarily unsuitable for bromoils. Manipulations were carried on as usual with every sheet working perfectly and producing detail and delicate half tones almost beyond belief.

To all appearances the riddle was solved, and it meant that well aged paper was far better than fresh, but the inability to procure the former made it imperative to find a method to handle the latter. The tannin process was not working correctly, and as the bleacher is responsible for this part of the work, a series of experiments entailing many hours in time and hundreds of sheets of bromide paper finally lead to success.

I have wondered how many beginners following the former instructions used unsuitable paper ending in failure, and then condemned the whole process. Have they tried again or read other articles that may have helped by the recommendation of a bleacher or developer other than mine? Let us hope they did not quit entirely, or if so, it is requested that the following be given a trial.

DEVELOPER

Water	10 oz.
Sodium Sulphite	166 grains
Amidol	25 "
Sodium Bisulphite	25 "

Use fresh developer for each print, rinse well and immerse for ten minutes in the following

FIXING BATH

Water	10 oz.
Hypo	1 "
Sodium Bisulphite	100 grains

Wash not longer than fifteen minutes in running water, or five changes of several minutes. Drain and blot surface dry, or immerse at once in

CHAS. H. PARTINGTON.

SNOWLIGHT.



BLEACHER

“A”

Water	30 oz.
Coppersulphate	480 grains
Sodium Chloride (salt)	2500 “

Add a few drops of hydrochloric acid to clear the solution. Clearing will be effected in two to five minutes, and rushing it with too much acid will be detrimental.

“B”

Water	15 oz.
Potassium Bichromate	125 grains

FOR USE

A	9 oz.
B	2¼ “
Water	15 “

Wash sufficiently to clear yellow stain which should not be longer than ten minutes in running water. Any slight stain will clear in

FIXING BATH No. 1

Water	10 oz.
Hypo	1 “
Sodium Sulphite	½ “

Fix for six to eight minutes and transfer *without washing* to

FIXING BATH No. 2

Water	10 oz.
Hypo	½ “

Fix fifteen minutes, and wash thoroughly for the same time.

The above formulæ and operations produced perfect inking bromoils on the P. M. C. No. 8 paper that had formerly refused to work. It has produced beautiful results on new or old paper of various grades and makes. Slight differences in inking to the extent of lighter or heavier inks and brush action. The P. M. C. No. 8 which refused to work at first must be inked directly after washing out the bleacher, as it does not ink perfectly if allowed to dry. Soaking some makes of paper only until limp produces the best results, while others



AFTER THE STORM.

Taizo Kato.

demand a longer immersion in water previous to applying ink.

Many formulæ and methods have been published on this interesting process. The various leading workers all have their pet ways, but it is a question as to what would happen if a change from a certain few papers were made. Pre-war stock was far better for bromoils than the present day kind which seems to form its troubles from a poor paper base, or wide variation in the emulsion. Papers from several years ago are wonderful, and those workers who have not used any other are missing a great chance for education. Success with the old stock was not a difficult matter, but producing a real bromoil with the material available to-day is somewhat of an achievement.

The whole question is in getting the paper in proper condition for inking whether by a change in formulæ, soaking, temperature, or ink. Some little trouble may be experienced at different times but all are urged to keep going. One successful bromoil is worth any amount of time and effort, so to the readers of the *Annual* who have experienced discouragement I say, try again.



CHAS. W. DOUTT.



ROCK BOUND.

JOHN C. CLEMENT.

NOTES ON SURF PHOTOGRAPHY

By JOHN C. CLEMENT



ONE of the most fascinating branches of the photographic art is found in making pictures at the seashore, and particularly along the cliffs after a storm. In making pictures of surf, while many beautiful studies may be made in comparatively calm weather, the real thrill comes when the waves are dashing high over the rocks with resistless force. It is a dangerous game if the photographer is not careful to take a safe position out of reach of the breakers.

The pictorial effects that can be secured are endless, but it seems to the writer that the soft focus lens is not as valuable for this purpose as for some other classes of work. The very thing that makes a picture of the sea and surf worth while is the sparkle and crispness of definition obtained with an anastigmat, or possibly a rectilinear lens. It takes time to properly adjust the focus of a soft focus lens, and with the spray flying it is a bit difficult, as well as exposing the camera to a salt water bath.



BREAKING WAVE.

Figure 1.
Illustrating article "Notes On Surf Photography," by John C. Clement.

It is entirely possible to get soft enough effects of distance with the anastigmat, and much speed is gained. It will not do, of course, to give such a short exposure as to make the breaking wave too crisp, but with a lens of soft focus an aperture that would give a true rendering of surf would in many cases be too slow. The final result can be slightly softened in enlarging if necessary. It is almost always an advantage to enlarge, as the enlargement brings out the breadth and feeling of the picture.

If one has an eye for artistic effect it can almost always be found, though there is more left to chance than in composing a landscape view. Just after a storm when the tide is on the flood is the best time for heavy surf views, but at such a time the light is often so dull as to make exposure difficult. Storms are not always obliging in the time of their arrival, and to a certain extent conditions have to be taken as they are found. Should the sun be bright especial care should be taken in the selection of a proper viewpoint, else the effect of the force of the waves and of the power that produced them be lacking. Atmospheric quality is especially necessary in views of surf. Another point which has been much emphasized is the importance of a low viewpoint. With the camera too high the waves flatten out in the picture and the effect is lost.

There are many surf and shore views which are very pleasing even though they may not have all the elements of an artistic composition. Referring to the illustrations, "The Breaking Wave" (Figure 1), this was a chance exposure, and was made without any idea of getting an artistic result. No claim of artistic excellence is made for the view "Rugged Shores" (Figure 2), though it is one of the writer's most liked prints.

Just a word for the film pack. Most photographic finishers do not like it, but it has seemed to the writer that this was because each exposure required more individual attention, thereby taking a little more time. It has been his experience extending over a good many years that this possibility of treating each negative separately is one of the strongest arguments in favor of its use.



RUGGED SHORES.

Figure 2.
Illustrating article "Notes On Surf Photography," by John C. Clement.

REFRACTION AND ENLARGING

By J. A. ERNEST ZIMMERMANN, B. S.



SINCE we have a great many workers that are not acquainted, or who have only infrequently heard the term "refraction," it is best to define and explain the word. It is the bending of light rays from their normal paths as they pass from a less dense to and through a denser medium, or from a dense medium through a rarer one; however, the index for a definite medium is always the same, irrespective of the angle of light. Most of us are acquainted with the illustration of the stick in water that appears to be bent at an angle where the same touches the water and the air. Having thus defined and explained refraction, the following question arises: "Does refraction play a part in projection printing or enlarging?"

During the year 1921-22, the author had the opportunity to perform, by experiments, the index of refraction for "Kodoloid" furnished him through the kindness of the Eastman Kodak Co. The mean of the results, the values of which were approximately similar, yielded the value 1.216, while the index for glass used in the manufacture of dry-plates yielded the value 1.516. The index for gelatine has not yet been determined, but is under investigation at present.

We will very readily understand why enlargements are "fuzzy," and what actually causes the "so-much-talked-about" diffusion by referring to the illustration (Figure 1). The thickness of these materials used was measured with micrometer, and is herewith given:

Clear glass of dry-plate	.1352 cm
Kodoloid from film negative, clear	.0209 cm
Gelatine	
Emulsified side	.0009 cm
Non-emulsified side	.0008 cm

Using a film negative between two glass plates seems to be the only way in which a negative of this kind can be kept absolutely flat in order to make an enlargement, and due to the fact that we have several mediums through which the

light must pass, we will consider only the impingement of light for the angles 10° , 20° , and 30° which will suffice for this treatise, although the investigation has been conducted for a great many angles of arc. It is also true that the lens tends to bring these light rays to a common focus, but it is impossible to have all these refracted beams meet at a common point, unless every light ray impinges upon the objects at right

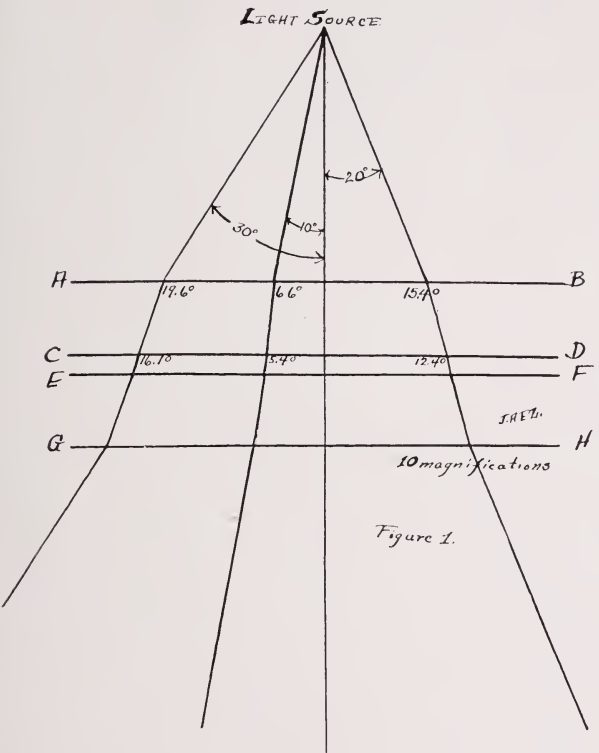


Figure 1.

angles to the refracting surfaces, for at 90° a light ray passes through the medium unaltered.

Let us illustrate: Allow the light ray (Figure 1) to strike the refracting surface AB at right angles and it passes through unaltered, emerging at the surface HG through CD and EF with the same angular displacement. Let another ray proceed with an impingement of 10° arc on the refracting surface

AB. This ray will be refracted and bend from the angle of 10° to an angle of 6.6° , pass through ABCD and emerge striking the second refracting surface CD and pass through the layer CDEF. It will, however, emerge through the layer EFGH with the same angular displacement (10°) if it is the same material. By backward projection of the emergent ray at GH and comparing it with the entrant ray at AB, it will be seen that the rays are parallel and not continuous, but the same have deviated from a straight line course.

Other rays can be easily followed for the angular displacement by studying the diagram. It is possible that the lens corrects some of the non-continuous rays, but the author is not at present able to give any definite statements, as this is also under investigation.

From the foregoing, it is readily seen that the "fuzziness," or diffusion, is due to nothing else than the refractive index, and the passage of the refracted and reflected light rays of the mediums through which the same pass. The same thing is true when a sheet of "Kodoloid" is interposed between negative and printing paper, or by placing the portrait film with gelatine side against the printing surface of the medium in order to produce softness, or to create an artistic atmosphere in the finished product.

It is claimed by some workers that the use of a ground-glass between the source of light and the object to be enlarged removes the action of refractive power, but such claim is not based upon fact. While the ground-glass tends to diffuse the light more evenly over the surface to be enlarged it does not remove the refractive index from the other materials used, and the author has never been able to remove the bending of a light ray from its normal path through a denser or rarer medium. The use of as high as four thicknesses of ground-glass have not caused any noticeable effect, nor changed the index of refraction in "Kodoloid" nor clear glass. It is even doubtful if an increase in the number of ground-glasses will cause an appreciable change.

Whether there is an index of refraction for ground-glass, and what the same is, remains to be determined. It is rather difficult to pass a light ray through this material due to its enormous diffusive power. It is, however, proper to assume



NIGHT'S CURTAIN.

W. H. Porterfield.

that the glass does have an index, since all other mediums have indices, and ground-glass does not seem to be an exception to the rule. But is the index of this material greater or smaller than for other glass? Our conclusion regarding the index for ground-glass is a factor, with which one has to deal

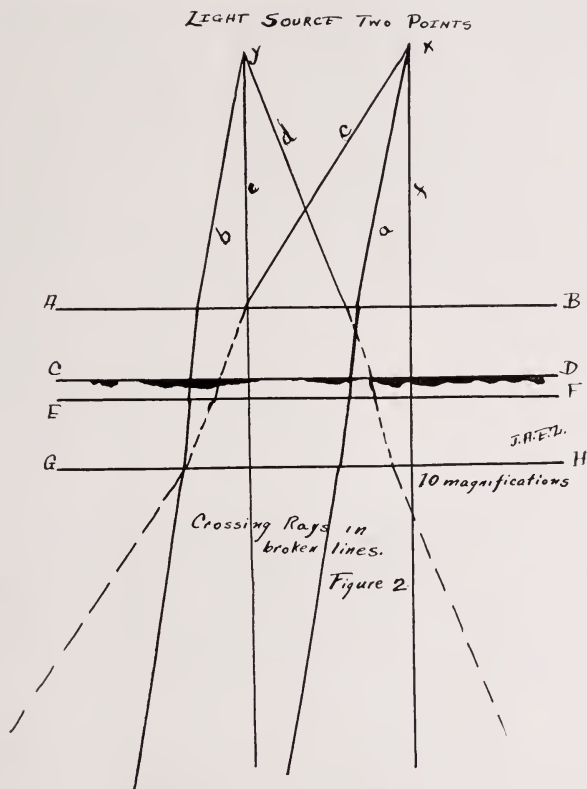


Figure 2.

if it is not the same as other glass. If it is the same as other glass it can simply be treated as one piece of solid material.

In conclusion let us consider Figure 2 in which two points are considered for light sources, in order to show more clearly why projection printings are more "fuzzy." Angles "a" and "b" are the same. The light source x and y proceed to surface AB and emerge after refraction at surface GH where they again move onward in parallel order. The beams "c"

and "d" proceeding from x and y cross each other and cause interference. Projecting them forward to surface AB, "c" interferes with "e". After refraction "c" interferes further with "b". Thus it can be seen that the greater the points of light sources, the greater the interference and the more softness is given to the prints.

The mottled effect in the diagram of CD corresponds to the silver deposit in the gelatine (it is exaggerated) where the light rays as they impinge are either absorbed or allowed to pass through. Since not all rays pass onward, it stands to reason that not all cause interference. A great deal of this interference also seems to be corrected by the lens used in making the enlargement, but as already stated not much can be said at present regarding the lens and gelatine as the same are under investigation.



E. J. BROWN.



BELLE JOHNSON.

THE MAKING OF A PAGET COLOR TRANSPARENCY

By FREDERIC G. TUTTON



ALMOST the only information available on the making of a Paget Color Transparency is the bare outline issued by the Paget Company themselves, while the majority of amateurs are left to guess of a more sure way in which to get the greatest success. Several possible workers in this process have told the writer that their objection to taking up this most fascinating and extremely beautiful process was one of uncertainty, that out of a dozen exposures, you could only expect to get three or four correct color positives.

It is the writer's intention in this paper to give a short road whereby a possible dozen good color transparencies can be obtained from a packet of a dozen plates. To the uninitiated perhaps it would be just as well to give an outline of the principles underlying this process so that they will see in what way this phase of photography slightly differs from making a monochrome print.

Apart from any plate camera which is fitted to take dark-slides, the following essentials are required before embarking on this process. A special filter for eliminating the ultra-violet rays, The Paget Special Taking Screen and panchromatic plate, a special viewing screen and transparency plate. The special taking screen is a glass plate having a gelatinous surface composed of minute squares of orange, green and blue-violet, each square being $1/350$ th of an inch square. If this screen be placed in contact with the panchromatic plate and a photograph taken of, say, red geranium with leaves, it will be found upon developing the plate that the image is composed of squares representing the taking screen, but with this difference, the red light will have passed through the orange of the screen and made a grey square on the negative, but the green and blue-violet, side-by-side, will be clear owing to the red being absorbed. The green from the leaves will have made a faint grey square, but the orange and blue are not represented, the green having



JAPANESE PEONIES.

FREDERIC G. TUTTON.

been absorbed by these two colors. The same with the blue, being absorbed by the orange and green but passing through the blue-violet.

From this negative a positive transparency being made, it will be noticed that where there was a grey square in the negative, more or less clear glass is represented in the positive, and clear glass in the negative will give a deposit in the transparency. As the "viewing screen" is an exact replica of the taking screen, with the exception of the colors which are slightly different, it will exactly superimpose on the positive, square for square, so that in the case of our geranium, the green and blue-violet color will be stopped out with the deposit on the diapositive corresponding to these colors on the viewing screen. The red square will be more or less clear glass, thus allowing the light to pass through the red only in the screen, giving to the image the sensation of a picture in red. The same with the leaves, only the red will be stopped out by a deposit on the transparency, the others more or less clear glass according to the degree of hue of the green.

From the foregoing it will readily be seen that much of the success depends upon rendering these squares clearly defined, and that the transparency shall be of a good clean black and white. To this end the dark-slide should be fitted with a good spring so that optical contact is made with the taking screen and the panchromatic plate, for it naturally follows that if good contact is not made in the first instant, well defined squares cannot be obtained in the negative. The position of the filter may be in front of, or behind the lens, or, between the lens, but for the sake of convenience, the front of the lens will be found to be the best.

In making the exposure it is essential that the light be tested by one of the exposure meters on the market, such as the Watkin Bee, Wynne Infallible Hunter, or others. Calculators are apt to be misleading in color work, and although the writer has used both calculator and actinometer, better results are obtained when the light is tested than when calculated. As all meters invariably give the minimum exposure, it is best to give at least double this time to insure getting good results, in fact a safe rule is to give double meter exposure under all circumstances,

THEODORE EITEL.

CARBON PRINT.



Developing the plate should offer no difficulty to anyone, whether they have previously used panchromatics or not. Provided that ample care is taken to see that no stray light falls upon the plate, it can be developed in a very deep red light, keeping the dish covered during development. The best, of course, is to use either a tank, or one of the numerous "Panchromatic Safe Lights" on the market. It is a matter of importance as to what developer is used, and it is strongly urged that the Special Color Developer supplied by the Paget Company be used. This developer can also be used to develop the transparency. A diluted and prolonged development is to be preferred to the more concentrated and shorter time. During an experiment made by the writer, it was found that a more brilliant color transparency was obtained from a negative developed by the diluted developer than from a negative of concentrated development—although the negatives were of the same subject and received the same exposure one after the other.

This diluted developer is made up as follows:

Paget Special Color Developer 1 part,
 Water 80 parts,

and to every one ounce of this solution add 1 drop of 10% solution of potassium bromide. The temperature is noted and the plates are left in for the length of time according to the degree of temperature.

Temperature	60 F or 16 C	Time	18 minutes
"	70 F " 21 C	"	12 "
"	75 F " 24 C	"	10 "

Where the subject is one of great contrast of light and shade, this time should be shortened (according to the degree of contrast), from one to two minutes. If the subject is very flat and somewhat dull in color, two minutes longer should be given for each degree of temperature. To insure that the best is gotten from the developer and the negatives free from stain, not more than six $3\frac{1}{4} \times 4\frac{1}{4}$ plates should be developed for each three ounces of developer. Fixing is done with any clean working bath, no preference given for either an acid or neutral one.

It is in the making of the transparency where more skill is required. A good printing frame with a pair of strong springs



Mrs. Sidney V. Webb.

is a *sin qua non* to making good contact between the negative and positive plate. Nothing of any nature must be interposed between, otherwise the squares would not register. Exposure required is rather a difficult matter to fix, as each case must be decided upon by the class of negative and the illuminant. As a rough guide, ten seconds at five feet distant with a 16 c. p. lamp would be suitable for a normal negative. It is far better to make a trial strip upon one of the positive plates in the same way as making a trial strip for a bromide print, giving say, 5, 10, 15 and 25 seconds respectively. This plate is then developed for *two* minutes in the following developer at 60° F.

Paget Special Color Developer 1 part.

Water 20 parts.

Longer than two minutes immersion will only veil over the clear part of the transparency making the resultant colors somewhat dull. The plate is fixed and well washed, then put aside to dry, away from dust.

The resulting transparency is then superimposed with the special viewing screen, and both moved about until the colors show more or less correct. If the ten second strip was the correct exposure, this strip will show the colors correctly, the five second strip will show the colors rather pale, fifteen second strip the colors rather heavy and the twenty-five second strip will have black predominating. Another transparency is then made, giving to the whole plate ten seconds exposure at the exact distance from the illuminant as the trial plate development is carried out for the same length of time. Of course, it must be quite understood that the above times are only given as a suggestion, the exact trial time must be found by each worker, and once found will form the exposure required for different classes of negatives, but this method of estimating the correct exposure is strongly recommended as being the only method where waste of positive plates is eliminated.

It sometimes happens that neither of the strips show the coloring correctly, the five second strip colors are very pale, ten seconds the colors are still pale, while twenty seconds show the colors too heavy. It may also happen that an exposure between the ten and twenty seconds fails to give a good color

rending. When this happens, it is recommended that a fresh trial strip is made, giving say, five, eight, ten and twelve seconds exposure. This strip plate after developing, fixing and washing in the usual way, must be intensified. The following solution is made up.

Potassium Bichromate 5 grs.,
 Hydrochloric Acid 10 min.,
 Water 10 ozs.,

the plate left in this until the image is bleached throughout, rinsed in running water for about two minutes and transferred to the following bath.

Potassium Metabisulphite 10 grs.,
 Water 1 oz.,

left in this until the yellow stain has disappeared, well washed in water and redeveloped in

Paget Special Color Developer 1 part,
 Water 15 parts,

well washed and dried.

Positive and viewing screen is then superimposed, and a note made of the strip giving the correct colors. A fresh positive is then made giving the exposure required, developed and intensified as in making the trial strip. After the final washing and drying, it is then ready to be bound up with the viewing screen for final use.

Binding the two together is done with ordinary lantern binding strips, while the plates are held together with a pair of strong springed paper clips, each side being done separately, and the clip not being removed until all the sides are bound together. It is advisable that a record be kept of the exposures required for each negative, otherwise it may happen that a color transparency is required from an old negative of which the exposure is forgotten. The writer uses a book ruled in the following manner and which explains itself.

No. of Negative	Illuminant	Distance	Exposure	Intensification	Other Remarks
1	16 c.p. Elect.	5 ft.	10 s.	.....	.....
2	16 c.p. Elect.	5 ft.	8 s.	Yes	.....



ATALA.

LOUIS A. GOETZ.

HINTS ON ARCHITECTURAL PHOTOGRAPHY

By A. LOCKETT



HERE is no denying that architectural photography is not so popular as it might be, and ought to be. This perhaps, is partly due to a curious heresy started some years ago among certain pictorialists. An architect's triumph, they maintained, lies simply in the masterly arrangement of stone or brick, the clever disposition of line and curve, in relation to the pre-calculated lighting that will fall upon them. Hence, his building is a work of art in itself, and any photograph of such, however happily or originally handled, will be merely a copy of something already there. There is no pictorial credit in making even a first-rate copy of a Raphael Madonna, it was argued; neither, then, should greater praise be bestowed on the copy of a soaring dome by Michelangelo or Brunelleschi, or a campanile of Giotto's.

There is, however, a profound fallacy in this argument. A painting is flat, while a cathedral is not. In copying the painting we have no choice of setting, no possibility of varying the arrangement or composition, no opportunity for expressing individual feeling or sentiment. Technique apart, there is little to choose between two photographs of the same painting by different workers, but there may be all the difference in the world between two presentments of an architectural subject. It is quite possible for one worker to introduce a suggestive meaning and beauty into his rendering of even an ugly, commonplace structure; while another will make, perhaps, but a soulless, monotonously-even and regular presentment of some medieval masterpiece in marble. It is because there has been too much of the latter kind of thing that architectural photography has diminished in esteem. It has given us guide-book illustrations rather than artistic studies.

The antidote, to a great extent, is to concentrate on small portions of the subject, in preference to showing the whole;

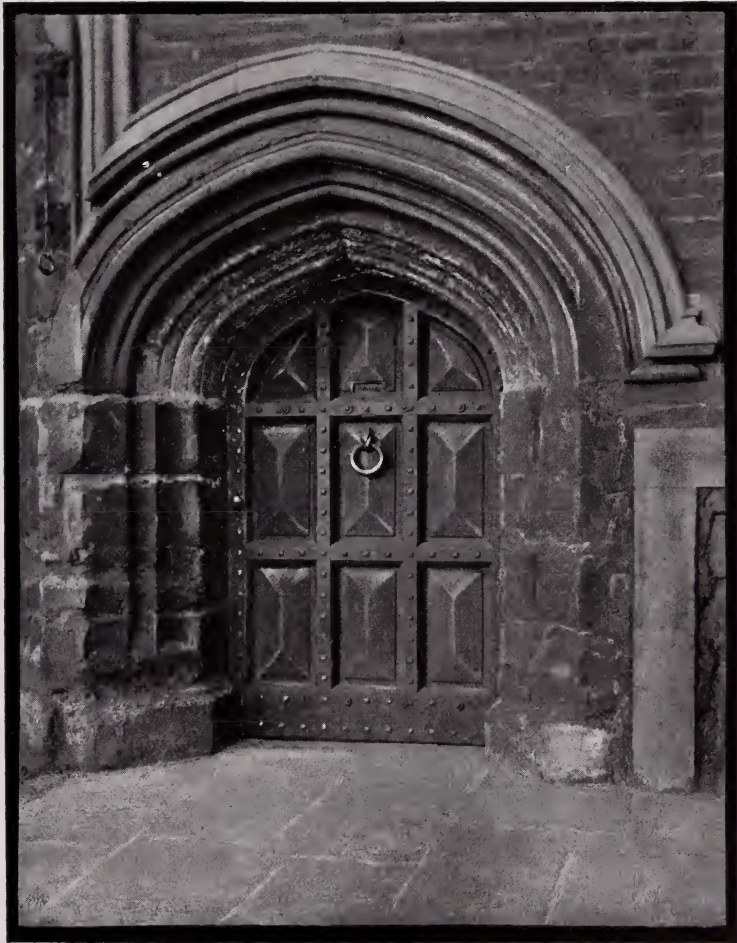


Figure 1.

POSTERN DOOR, LAMBETH PALACE.

Illustrating article "Hints on Architectural Photography," by A. Lockett.

to pick out worn and battered parts instead of exquisitely smooth avenues of columns that might be fresh from the builder's hands; to select detail that depends chiefly on curves, avoiding an excess of straight lines; and, most of all, to choose material that has some human appeal, story, or significance.

Much has been written about special outfits for architectural work, the importance of rigidity, the range of movements needful, such as the rising front, side adjustment, swing back, etc. All this is true enough, but the worker must guard against a tendency of succumbing to the mere mechanism of the camera. These adjustments should be regarded as useful means to an end, which may or may not have to be utilized, not as inevitable instruments in an inflexible time-table. We often see an exasperated photographer spending, may be, a quarter of an hour attempting to get his upright lines vertical in the orthodox manner, with spirit-level and plumb indicator, on a slippery pavement. As might be expected, every well-meant touch introduces some fresh deviation. The common-sense way, in such a case, is first to set the camera back vertical to the base-board, to see that the lens-front is also upright and central, and then to fix the camera on the tripod and adjust by moving the latter alone, till the image is satisfactory on the ground-glass.

Here we come to an important point. The ground-glass for architectural work should be specially fine and clear, and there should be ruled on it a number of truly horizontal and vertical lines, about $\frac{1}{2}$ in. apart. These will be of great service in levelling and squaring the subject, since they show at once whether any part of the image is out of the straight. One must not, however, jump to the conclusion that all architectural lines really *are* straight. Some are far from it, especially in old buildings, and when this is ascertained a note should be made, so that they may be allowed their natural slant or slope in the photograph.

The camera back must invariably be upright, and it is undesirable to tilt the base-board if that can be avoided. The rising front should render tilting unnecessary, or the camera may be worked from a higher level. If, by any means, the lens axis is inclined with respect to the plate, the lens must be stopped down. Some workers do not trouble much about



Figure 2.

THE CLOISTER DOORWAY, WESTMINSTER ABBEY.

Illustrating article "Hints on Architectural Photography," by A. Lockett.

keeping the back upright, but are content to correct the slanting lines when enlarging, by tilting the negative and easel. This method is very handy as an emergency resort, but there is no need to turn it into a habit.

If only one lens is available, the most generally useful focal length will be about equal to the longest side of the plate. An anastigmat lens with a large aperture has the advantage for dim interior work, the next best being a rapid rectilinear. For subjects which cannot be approached sufficiently, a low-power telephoto lens is occasionally invaluable.

The best time of day for a given subject will need some attention, the wisest plan being to pay one or two preliminary visits. It is a mistake to accept too trustfully the advice of other workers, or of officials on the spot, because ideals differ considerably. What seems an impossible or eccentric lighting to one person may really be of the greatest beauty if proper judgment and selection are used.

Exteriors are the easiest subjects, though usually less effective in a pictorial sense than interiors. It is interesting to specialize on the smaller details of ancient buildings. Gateways, particularly, occur in infinite variety. The illustration, "Postern Door, Lambeth Palace," is a handsome and substantial specimen, built by Archbishop (afterwards Cardinal) Morton, in 1490.

A voluminous and perfectly opaque focusing cloth is desirable for interior work, otherwise extraneous light will prevent proper judgment of the dim detail on the screen. A good pocket electric torch, held by an assistant where directed, is useful for judging the focus in really dark interiors.

Rigidity is the most desirable property of all in apparatus for architectural photography, on account of the long exposures sometimes necessary, and the fact that an exposure may have to be made in stages, to keep parties of visitors out of the picture. As a matter of fact, the tripod stand is more likely to be shaky than the camera. It should not be too light, nor too springy. To counteract the sliding of the points on polished surfaces, a good idea is to cut three equal lengths of stout wire, about 1 ft. 1 in. long, bending each end over at a right angle for about 1 in. Small screw staples are then fixed in at the sides of the tripod, about 1 ft. 3 in. from the



Figure 3.
IN THE CRYPT, WESTMINSTER CATHEDRAL.
Illustrating article "Hints on Architectural Photography," by A. Lockett.

top. To make the stand rigid, it is then only necessary to insert the ends of the three wires in opposite staples.

It is often recommended to put rubber or cork tips on the tripod points. This certainly prevents injury to a marble or waxed oak floor, but is little protection against slipperiness. A better idea is to borrow a large door-mat, which is nearly always forthcoming; or to obtain three of the thin "kneelers" commonly met with in churches and cathedrals, and to place these under the unprotected points, digging the latter well in.

At the best, the tripod is such a nuisance that it should, if possible, be dispensed with. It is often quite feasible to support the camera on a stone ledge, the edge of a balcony or gallery, the pedestal of a statue, the top of a flight of steps, or similar places which afford opportunities—sometimes even, if officials are gracious, in a pulpit. A useful hint is to carry a square of felt the size of the base-board, on which to rest the camera in such cases; this helps to prevent it shifting. The illustration, "The Cloister Doorway, Westminster Abbey," was secured by resting the camera on a stone seat.

Subjects including polished marble are often difficult, owing to the many reflections. The way to overcome this is to select a dull day and allow a long exposure. This gives sufficient brilliance and character to the marble, without excessive reflection. The illustration, "In the Crypt, Westminster Cathedral," a noble example of modern Byzantine architecture, designed by J. F. Bentley, was obtained in that manner. A liberal and, indeed, what might almost be thought excessive, exposure is advisable in all architectural work, except well-lighted exteriors. Without doubt, an exposure meter is next to indispensable.

Fast orthochromatic plates are best, though they need not be ultra-rapid, and they should certainly be backed. A rather dilute developer usually gives the most satisfactory results, although some subjects will do well with the solution at full strength.

The worker must be prepared to find that architectural negatives will not always respond to "straight" printing methods. Very often control of some kind is necessary, such as shading with a card to keep back thin portions while denser



Figure 4.

CHAPEL OF THE SACRED HEART,
ST. AUGUSTINE'S, RAMSGATE.

Illustrating article "Hints on Architectural Photography," by A. Lockett.

parts are printed deeper, matt varnish and pencil work on the back of the negative, etc. Flat-looking negatives can sometimes be much improved by a little retouching in the high lights.

The illustration, "Chapel of the Sacred Heart, St. Augustine's, Ramsgate," is a typical instance of a subject that needed control while printing. The East end, with the altar, was deeply in shadow, so that, to get full detail in the exquisitely-carved stone Stations of the Cross, seen on the left, a piece of card had to be cut to cover up the end portion when sufficiently printed, this being tacked outside the frame and tracing paper pasted over all.

It may be of interest to state that this somewhat small monastic church is known as "Pugin's Gem." The illustration, "Rood Screen and High Altar, St. Augustine's, Ramsgate," will give some idea of the rich, yet dignified and sombre, ornament lavished upon it in every part. Here, again, the stained glass window wanted extra printing, so a card was cut with an opening the required shape but a little smaller, and tacked over the frame with a covering of tracing paper, as before described.

There are many subjects which can be rendered perfectly with one of the tiny modern pocket cameras, fitted with a high-grade lens and taking either films or plates. The photographer who is fortunate enough to possess several of these may greatly shorten his total time of working by setting them to expose at different points simultaneously, whether in addition to his stand camera or by themselves. Of course, this can only be done when there are but few people about, or there might be a case of kleptomaniac annexation! Owing to the depth of definition of the short-focus lenses, the small negatives, or even selected portions, can be enlarged to a remarkable extent without appreciable loss of detail.

It may safely be asserted, in conclusion, that the worker who has hitherto confined himself to taking more or less tame and hackneyed pictures of landscapes, which invariably lose when mentally compared with their brilliantly-coloured originals in Nature, will find a new pleasure in his craft on making acquaintance with architecture as a photographic study. Here, his results are not so likely to disappoint, but, on the contrary,

are often apt to reveal new and unexpected beauties, which failed to attract notice in the original building. Studied historically as well as artistically, they will offer a constantly widening field of interest, instruction and admiration.



Figure 5.

ROOD SCREEN AND HIGH ALTAR,
ST. AUGUSTINE'S, RAMSGATE.

Illustrating article "Hints on Architectural Photography," by A. Lockett.

SNAP SHOTS ABOVE THE CLOUDS

BY WARREN R. LAITY



OW, when there is scarcely a town of any size which does not have an aeroplane visiting it for the purpose of taking up passengers, it is only natural that the cameraist should turn his attention to getting some photographs from the air. And especially so when almost every pictorial supplement, or thrilling movie, has some marvelous examples of this fascinating phase of photography. There are no more difficulties attached to this type than any other snapshot work, though certain points must be kept in mind, and the purpose of this treatise is to acquaint the reader with these points.

When you first enter the plane and seat yourself behind the screeching motor, and from thence on until you have lumbered heavily across the field and finally drifted exultantly into the air, you will be in no mood to use a camera, and you must expect it to be so. Even after the plane is well up and climbing on toward the fleecy clouds it is best to sit tight and take it all in. It is only the most experienced flyers who are not absorbed by the moments when the plane is transforming itself from an awkward bumping monster into a swift gliding creature of the air. Once up where the earth begins to assume the appearance of a huge map, you can begin to collect your photographic thoughts.

The camera may be any of the usual hand types, among which are the hand camera, the Graflex, or a regular aerial type. All do good work, though each have their own limitations. The hand camera should possess one of the wider aperture lenses which work at $F/7.7$, or larger. The shutter ought to have a speed of $1/100$ of a second to overcome the vibration of the motor and the speed of the plane. A direct view finder is a great aid, for the safety belt makes it impossible to use the regular finder, as it is necessary to remain strapped to the seat.

The Graflex will do the same class of work as the hand camera, though the lens is apt to be better, and there is no danger of the wind crumpling the bellows. It is best with



CAPITOL AT WASHINGTON, D. C.
Altitude About 2500 Ft.

E. J. BROWN.

this camera to bring the shutter speed to 1/100 of a second by increasing the tension of the curtain spring to the maximum for that speed. The particular value of the above cameras are that, with a lens of normal focal length, it is possible to include a portion of the wing or other plane structure which gives the desired perspective so often lacking in the pictures made by the regular aeroplane cameras. These aeroplane cameras, though using only a 4x5 plate, are often fitted with an 8¼ in. lens. The result of this is that, if any part of the plane is included it is generally a bit of meaningless fuzz. Of course, this telescopic feature is very essential at times though it does not produce the pictorial effect of perspective.

The subjects will vary with the locality, but it is wise to pick out those sections of landscape that have plenty of contrast, for the average aerial landscape takes "flat," due to the haze, and it is well to introduce some brilliant subject to break it up, such as a city, picturesquely laid out in parks and squares interspersed with some fine public buildings, a stream, pursuing its devious way under bridges, by a town or perhaps uniting with another body of water. A curving shore line, where white crested waves break on a sandy beach or over dark masses of rock, presents a dramatic subject. If you chance to live near a large city there ought to be opportunities to photograph prominent buildings at such angles as to reveal secrets of plan and structure that the casual observer never sees.

Another entrancing subject is a sunset pictured from above the clouds. Here the effect is overpowering, and the great feathery billows tinged with red and gold stretch out like an ocean stilled in its tossing. A sight like this calls forth all the poetry of your soul and makes you long to crystallize the scene. A filter will help in any of this work, and especially here, though it is well to use the weakest one possible, and retain speed, the K1, W & W being the best standard to go by. When you have become more experienced it is exciting to arrange with someone else in another plane for an "aerial rendezvous," and take turns snapping each other's pictures. For this though the pilots must be well trained, and it is even then a delicate proposition to fly near enough each other to get recognizable pictures.



"THOU CHILD SHALL BE CALLED THE PROPHET
OF THE HIGHEST."

Roy H. Heiser.



The exposure should be the same as for subjects on the ground, but, due to haze and angles of reflection it is best to increase it about a third more. In oblique snaps the time is essentially the same, but when looking down this increase must be noted. It is possible to use less time than $1/100$, and more also, though that must be left to the judgment of the operator. At all times he must realize that the camera should not rest on the plane, for the intense vibration will ruin the snap. And too, it should be noted that while near the earth the fast shutter speeds must be employed, for a plane travels between 60 and 80 miles an hour normally, so the pilots tell us. It is so fast, however, that houses and other objects appear elongated and blurred if the shutter speed is not sufficient to overcome the plane speed.

Judging approximately, 1500 feet altitude is a good place to begin photographing. And in order to find out how high the plane is, it is wise to arrange for signals with the pilot. A very good idea when nearing the ground, or whenever making an exposure, is to have the pilot stop the motor and let the plane drift while the picture is being taken. If the passenger can stand it, the plane could be slightly banked at the same time in order to insure a better view. In all these matters let me urge earnestly that the *arrangements* with the pilot, the shutter calculations and exposures *be planned before the start*, for once up, you may not be able to think as clearly as you may wish.

It is generally advised to develop in pyro and place the negative directly in the hypo in order to get the greatest contrast.



STILL LIFE

DR. F. DETLEFSEN.

ON THE PRESENTATION OF A PHOTOGRAPHIC SALON

By PERCY NEYMANN, Ph.D.



THE first international Salon of The Pictorial Photographic Society of San Francisco was on view at the Palace of Fine Arts from May 19th, to June 24th, 1922.

Illustration No. 1 represents a corner of one of the series of connecting rooms used, and demonstrates the manifold advantages of hanging photographs, or prints of any kind, on a line with the vision of an observer. The frames permit of the use of glass, the proper placing and protection of prints, and the use of a neutral tint background.

Inspection of illustrations Nos. 2 and 3 demonstrates at a glance that there is something wrong with the presentation of the prints in No. 3. The primary error is in the overlapping

(Editorial Note). Dr. Neymann is the Secretary of the Pictorial Photographic Society of San Francisco, the earnest body of men who are to be accredited with the Salon mentioned. The deductions are the product of experience and study. The Salon committee has brought to bear on their ideas the opinions of many pictorialists. Mr. Laurvik's standing among Art Museum Directors and artists is such as to make an opinion or a suggestion from him of the highest value.

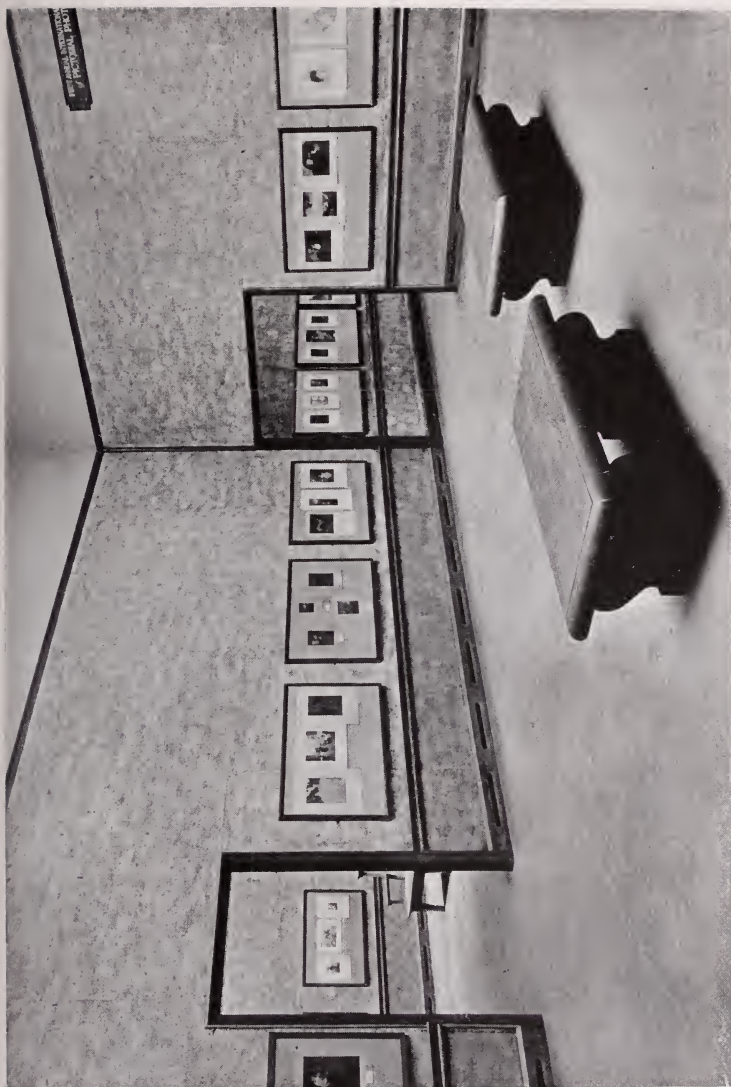


Figure 1.
 ONE OF THE CONNECTING EXHIBITION ROOMS,
 SAN FRANCISCO SALON.
Illustrating article "On the Presentation of a Photographic Salon," by Percy Neymann, Ph. 1:

of the mounts, prompted by the desire to economize in space. There should have been but two of the prints in the one frame. The ratio of the area of mount showing is to the area of the print as three to one for each print.

In a conversation with Mr. J. Nilsen Laurvik, Director of The San Francisco Museum of Art, through whose interest and courtesy the Salon was so well shown, Mr. Laurvik expressed the opinion that a ratio between the size of print and the size of mount should be determined. What that ratio should be is a problem not readily solved.



Figure 2.
THE CORRECT WAY OF MOUNTING AND EXHIBITING PRINTS.

It is solved, however, by the arrangement and mounting of prints as shown by illustration No. 2. The card or underlay upon which these prints are mounted extends about one quarter inch beyond the print at the top and sides, and one half inch at the bottom. The prints are fastened to the backing, consisting of properly tinted beaver board or its equivalent, and this forms an ideal background. To the minds of all observers who have been questioned this method of presentation is superior.

Aside from the artistically ideal exhibition of prints at a Salon, there are considerations favoring the more practical aspect. Among these are the economy in mounts and mounting, the

economy in packing and transportation, and the avoidance of unnecessary bulk and weight.

The observations recorded above are virtually a discovery made and a lesson learned at the San Francisco Salon of 1922. We ask the reader's indulgence in stating the following, considered as a guide to the presentation of future Salons, and as a beneficial suggestion:

While the San Francisco Salon had the distinct advantages of showing prints as described and illustrated, there is no reason why these advantages should not be accorded any Salon, provided the energy and aggressiveness are forthcoming.

As an example of the best possible presentation of a photographic exhibit, the statement of those who have seen many Salons is to the effect that the first Salon at San Francisco equals, if not excels, the showing of prints anywhere at any time in the past, and we, therefore, expect and solicit the co-operation of Salon officials and contributors to the end that all Salons, wherever held may be shown with an appreciation for greater beauty and greater benefit to the public and photographic art.



Figure 3.
THE WRONG WAY OF PRESENTING PRINTS FOR EXHIBITION
PURPOSES.

*Illustrating article "On the Presentation of a Photographic Salon,"
by Percy Neymann, Ph.D.*

RAPID FIXING BATH

By HENRY F. RAESS



ABOUT fifteen years ago some one proposed the addition of ammonium chloride to the usual fixing bath to increase its rapidity of fixing. The theory is that the bases change places with the formation of ammonium thiosulphate. While this new fixing bath does work more rapidly, it seems to have aroused but little general interest, and apparently no practical application was made of it.

But the use of ammonium thiosulphate instead of sodium thiosulphate or "hypo" is not new. It was first suggested by John Spiller in 1868 and has at times been indorsed by various workers. But the cost made it prohibitive, which is about thirty times greater than ordinary "hypo."

There is a class of photographic work where speed is very important, as for instance in newspaper work, especially when having to catch an edition. Then there is photo-syndicate, passport, "photostat" and no doubt others.

At the time that this new fixing bath formula appeared in print the writer made some rather rough tests, and found that as the amount of ammonium chloride increased the speed of fixing became progressively greater. The bath on standing also evolved ammonia gas (NH_3) probably due to the action of the alkali from the developer.

But most photographers think by increasing the amount of "hypo" in their fixing baths they will also reduce the time of fixing. How true this is will be seen in the table below.

Table No. 1.
Plain "Hypo."

10%	15%	20%	25%	Saturated solution about 40%
Sp. Gr. 1.053 13 minutes	Sp. Gr. 1.084 9½ minutes	Sp. Gr. 1.117 5 minutes	Sp. Gr. 1.140 4 minutes	Sp. Gr. 1.406 No action after one hour.

The specific gravity of the plain "hypo" solutions are also



THE CHRISTMAS HYMN.

KATE MATTHEWS.

given for the benefit of those who like to prepare their baths by the hydrometer. To ascertain the speed of fixing fast plates were cut into one inch strips and the determinations made with these.

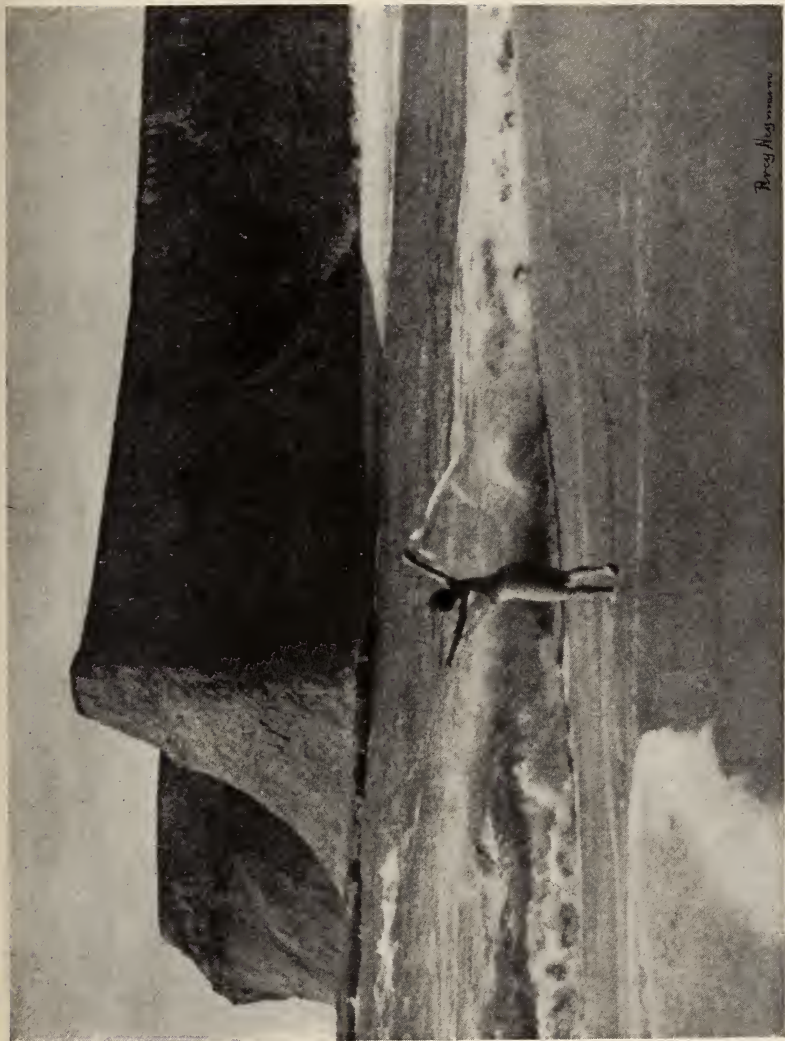
It will be noticed that the practical limit is reached at 20% although 25% is slightly faster. Above this strength the speed gradually becomes slower until saturation is reached when fixing practically ceases.

The one formula containing ammonium chloride for a rapid fixing bath which was published at the time as mentioned above made the rounds of the photographic magazines with practically no change. Apparently no one undertook to see if the maximum speed had been obtained, or if any improvement could be made. For a time this bath became quite popular and several European photo-chemical manufacturers placed it ready for use on the market, but it soon was forgotten again.

The Lumiere's instituted some tests with the new bath, and issued a warning that it was important to remove all the chemicals after fixing by a thorough washing to insure the permanency of the plates, films or prints. But those who have used this type of bath found no later difficulties through its use and liked the results. It was the writer's endeavor to evolve a formula possessing the greatest speed and having no disadvantages. Ammonium chloride was added to the above plain "hypo" solutions (See Table 1), in molecular amounts to form the corresponding ammonium thiosulphate, due regard being paid to the fact that sodium thiosulphate crystals contain five molecules of water and ammonium chloride none. The same also for ammonium thiosulphate which is practically anhydrous. Comparisons were also made with ammonium thiosulphate of equal (molecular) strengths (See table 3).

Table No. 2.
"Hypo" with ammonium chloride.

10%	15%	20%	25%
6 minutes	1½ minutes	2 minutes	2¾ minutes



OCEAN, THOU MONSTER.

Percy Neymann.

Table No. 3.
Ammonium Thiosulphate.

10%	15%	20%	25%	30%
7 minutes	not made	1¼ minutes	1¼ minutes	1½ minutes

From table No. 2 it will be seen that the maximum fixing speed is reached at 15%, while the original formula called for a 22% solution, and consequently was somewhat slower.

The next step now was to make a bath of the greatest speed which would not evolve ammonia (NH_3) and harden the gelatine at the same time. The writer for some time had been using the Kodak fixing bath for plates, films and paper with excellent results. The fixing speed of this bath which contains about 22% of "hypo" was six minutes. The amount of ammonium chloride necessary to form the ammonium thiosulphate in the Kodak bath was then weighed out and divided into four portions, and the fixing speed noted after each addition to the bath. After one half of the ammonium chloride had been added the maximum speed had been reached—this was two minutes. Additional amounts of ammonium chloride decreased the speed of fixing. The Kodak fixing bath with ammonium chloride has the following composition:

Water	1 gallon	4 litres
"Hypo"	2 lbs.	900.0 gms.
Ammonium chloride	6 ozs. 5 drams	195.0 "
Hardener	16 ozs.	500 C.C.

Hardener Stock Solution.

Water	40 ozs.	1200 C.C.
Sodium sulphite, dry	8 "	235.0 gms.
Acetic acid, 28%	24 "	720 C.C.
Alum, common	8 "	235.0 gms.

Those who prefer their own formula for a fixing bath may get approximately the same increase in speed by adding 1/5 of the weight of "hypo" of ammonium chloride, excepting in the case of plain "hypo" bath, then add slightly less than one-half. The purity of the ammonium chloride used was that known as "technical" and cost about twenty-five cents per pound.

LARGE HEADS IN PORTRAITURE

By T. W. KILMER



At a recent meeting of prominent New York photographers, one of the speakers said that the man or woman who could successfully make large heads in portraiture, would not want for success as a portrait photographer. I truly believe that this man spoke words of wisdom; for if there is one branch of photographic portraiture that is hard to accomplish, and which is "murdered" more than any other, it is the correct photographic rendition of a person's head.

To most of my friends who have so kindly sat in front of my 18 inch lens, it has been their desire to be so reproduced. It is true that the trunk, arms, and hands, and in some instances the remaining figure, are distinctive attributes of the head, but in ninety percent of people, it is a photograph of the head (face), that their friends desire to keep as a photographic document.

In this age of specialism, the man who makes photographic portraits of but one thing, the head, is going to get better results than the man who photographs the head, arms, hands and a large part of the trunk. The former sees but one thing, and does but one thing, while the latter has a confusion in numbers, and the final product is anything but pleasing.

In portraits of the face alone, the light should be fairly high, and not counter-balanced by an over-use of the reflecting screen. The background should be of a uniform tint, either dark brown, or dark grey. The background should not be too close to the sitter. An element of atmosphere is created by placing the background several feet back of the sitter. The lens by all means should be of a sufficient focal length. Do not ever try to make a head on an 8 x 10 plate unless you use a lens of at least eighteen inches focus, for if you do, you will certainly get distortion in the features of the person photographed. I am absolutely sure of this, and know it to be so, because I have experimented exhaustively along this line of large heads and long focus lenses.



HEAD OF A HINDOO.

Illustrating article "Large Heads in Portraiture," by T. W. Kilmer.

For a large head, do not stop the lens down. I am in favor of a slight amount of diffusion, either procured direct in taking by means of a soft focus lens, or done by projection. In the taking of large heads, have the sitter's nose about on the level with your lens. Do not shoot down or worse still, up, at your sitter. Bad results will follow. Give a good generous exposure, and do not over develop your negative. I always use artificial light; Cooper-Hewitt tubes, tempered a little with a few nitrogen bulbs. I get better results with film than I do with plates, especially where a full open soft focus lens is used.

The spacing of the head with reference to the boundaries of the size of print, is very important. Never place the head in the center. It is my favorite custom to place the head a little to one side of the print, and have some highlight or shadow on the opposite side of the print to balance the head. Give the head room into which to look. The pose of a head is greatly controlled by the position in which the person sits. Do not let them squat in a chair, have them sit on a good hard posing bench, give them room to sit.

My favorite printing medium for large heads is multiple gum. The first few printings in brown and the last two or three of charcoal grey, or ivory black.



CHAS. W. DOUTT.



HEAD OF AN ARAB.

Illustrating article "Large Heads in Portraiture," by T. W. Kilmer.

SHARP OR "FUZZY" PICTURES?

By A. H. BEARDSLEY



It has been with no little interest that I have been following the trend of picture-making during the past fifteen years. When the anastigmat lens was first winning its way, sharp definition was the thing; and pictures were approved or rejected on the basis of their brilliancy, crispness and detail. Lenses were compared with sharp definition as the standard.

Then, came a reaction. Some thought that pictures were too sharp and that they lacked atmosphere—whatever that may or may not be. A soft-focus lens made its first appearance, and it was "soft" in definition and covering-power. As one amateur expressed it, at the time, "The pictures look just as well upside down as right side up. If it wasn't for the title, I wouldn't have the faintest idea what the photographer had in his mind, let alone what he thought he saw in front of the camera."

Photography appeared to be going through its cubist period. Even the most "pictorial" pictorialist of to-day would admit that some of the first soft-focus pictures appeared to be the result of tremendous nervous strain and hallucination on the part of the "advanced" photographer of the period. Gradually, such extremes gave place to more recognizable and pleasing pictures, although diffusion was still very much in evidence.

The "advanced" amateur, or professional, continued to explain atmosphere and to tell us that what he showed in his picture was what we saw in nature—whether we did or not. And so things went along, until soft-focus lenses increased in numbers and in popularity, among those photographers who called themselves pictorialists. Others bought soft-focus lenses and either mastered them, or gave up photography altogether. Finally, we arrive at the present. The soft-focus lens is strongly intrenched, and there are many excellent types. Likewise, the anastigmat lens is still very much in evidence. As I said in my paper in last year's *Annual*, both types of lenses should be used, and not one or the other. The choice of which



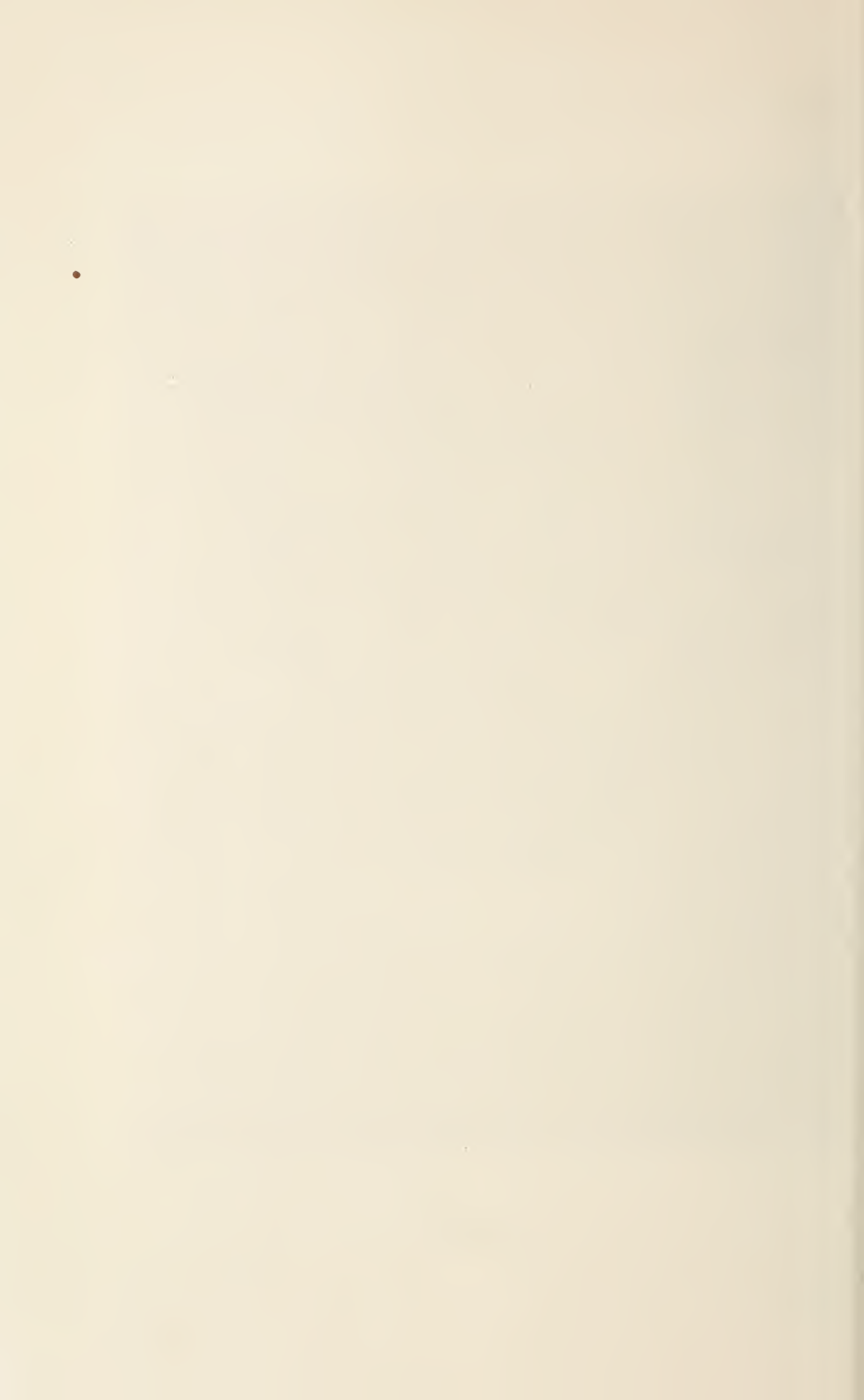
to use must depend on the photographer's good judgment, experience, art-training and the subject.

This brings me to a consideration of sharp or "fuzzy" pictures from the point of view of amateur and professional photographers and the general public. I might add that whatever observations I may make are based on facts, and with a sincere desire to induce a frank and constructive discussion that will help us all. What we need in photography to-day is less faddism and more getting down to the beautiful, fundamental principles that make photography second to no art or science.

Let me mention briefly a few incidents that served to awaken me to a realization that amateur and professional photographers, and the general public, are seriously weighing the relative merits of the sharp or "fuzzy" picture as exhibited at salons, in the press, at the motion-picture theater and in the home. First, a photographic magazine of unquestioned excellence, editorially and typographically, lost a number of subscribers who wrote plainly that they would not renew their subscriptions because of the prominence given to "fuzzy" pictures in its pages. They would renew gladly when "nice, clear-cut illustrations were used." Second, a would-be exhibitor asked me whether he dared to send a bromide enlargement to one of the large salons. He assumed that unless the picture was diffused or manipulated with oil or crayon it would receive small consideration. When I tried to reassure him he asked, "How many salon prize-pictures are well-defined, brilliant and attractive to the average beholder?" I had to admit that, of late, I had seen very few. Then he added this shot, "If these are *photographic* salons, why don't they stick to photography instead of permitting oils and crayon under the cloak of art? Isn't photography strong enough to stand on its own feet without leaning on pigments and pencils?" Third, an educated gentleman who visits art and photographic exhibitions with the sincere purpose of self-culture—although he is not a photographer or artist—writes a long letter which might be summed up in the question, "Why do camera clubs, and those interested in promoting photography, try so hard to get away from photography in the pictures that they hang for exhibition? The public goes to photographic salons and exhibitions to see *photographs*!" Fourth, another correspondent, a well-known physician, asks, "What is the idea, anyway, to



R. B. M. Taylor.



perfect and simplify photography, and when you have it within the grasp of the average individual, to turn right around and make it something that is neither art nor photography, and beyond the ability and interest of the educated layman?" Fifth, and lastly, one irate lover of sharp pictures asks bluntly, "Who told these 'fuzzygrafters' that a clear, well-composed bromide enlargement could be 'improved' by daubing it up with oil, gum and crayon; and, on top of that, make the original picture with a soft-focus lens? If they like to paint pictures why don't they paint them instead of messing up a good photograph?"

I might cite other comments of a mild or vituperative character—all against the present-day prominence given to "fuzzy" pictures. An interesting fact is that the verbal and written opinions against the "fuzzy" picture far outnumber those in favor of it. Moreover, these expressions come from photographers themselves, as well as from those who might be said to represent the general public. And again, they are all voluntary, and evidently actuated by a desire to arouse those concerned to a consideration of the situation as it presents itself to-day.

Taking into consideration every side of the matter, the question looms up as to whether or not the public is to be considered at all. Are the pictorialists sufficiently sure of their strength to say, "Here is a picture that is a work of true art, admire it, praise it and buy it," and to assume virtually that the public has no voice in the matter? Moreover, are they sure enough of themselves and their pictures to condemn as uncultured those who fail to admire their "fuzzy" works of "art"? In short, is it possible for a small but active minority to compel people to like something that does not appeal to them, merely by the assumption of a superior air of "artistic" culture which almost pities those who say frankly that they prefer clear, but not necessarily "wiry" pictures?

There is no doubt that there are many extremely beautiful soft-focus photographs which even the general public is not slow to praise; but these are out of the ordinary and not in the usual run of "fuzzy" pictures. As I understand it, a *real* picture speaks out for itself, it tells a story, it needs to lean on no title and it affects the beholder even as a beautiful melody. If a picture must be explained, must be supported

by much argument, must have a title and must be helped along to gain even the momentary glance of the beholder, then I am free to say that it is not a true picture, as I understand it. If I remember correctly, a famous art-critic once said that a *picture* was one that appealed to the trained connoisseur and peasant alike—that was the supreme test. This is true of sharp pictures as well as “fuzzy” ones.

With all our vaunted education and freedom of thought and speech, many “follow the crowd” because it is the thing to do, or because the “crowd” is strongly intrenched in popular favor. This applies to virtually every human activity, and photography is no exception. There are some camerists who have wasted much time and money on the gum or carbon-process, *not* because they liked either process for themselves, but because they thought that they ought to do so in view of their desire to be considered a pictorialist, or wished to be thought progressive, or simply because some friend thought that it was the thing to do this season at the camera club.

Many times, in these pages and elsewhere, I have advised my readers to stand upon their own photographic feet. By all means, let them study the work of recognized masters, learn all that is possible to learn; but when the time comes to choose for themselves in what direction they wish to travel, let them lean on no one but themselves and their own experience. Whatever they elect to do will be done because they will know what they want and why—not because Mr. A. or Mr. B. did so or said so, nor because “the boys” at the camera club are “all doing it” this year.

Let me remind my readers again that, in this article, I am setting down facts and comments, not because I wish to condemn the “fuzzy” picture, nor to belittle the beautiful work of most of our pictorialists. However, I do feel that there is a quiet, but strong, reaction against the extremes and faddism that has characterized some of the pictorial work that has appeared at salons, exhibitions, in the photographic and lay press and on the motion-picture screen. Mind you, when letters from the four corners of this country, and even from Europe point which way the wind is blowing, then, it seems to me that we should all get together and consider the matter frankly and without any other motive than the future success and prosperity of photography.



FOUR SCORE.

FLOYD VAIL, F.R.P.S.

Even at the risk of repetition, I am going to conclude this article by adding a few paragraphs which are written for the benefit of those who are either beginners or amateur photographers, and who appear to be at a loss to know what to do to win photographic fame and fortune, in view of the present situation. What I say is with the desire to help, and to further in every way possible the *permanent* pictorial success and prosperity of all lovers of photography, whether they be of the sharp or "fuzzy" school.

My own advice to the beginner or amateur photographer of little experience is to let "fuzzy" pictures alone until he can make good sharp pictures. In a sense, the making of a sharp photograph is to the diffused one as the practising of musical scales to the rendering of a vocal solo. There must be a firm foundation upon which to build. I have always advocated the mastery of a sharp lens before attempting the use of a soft-focus objective, and I extend this advice to include the making of prints. Of course, there may be exceptions; but I venture to say that the average inexperienced beginner would have his hands full with a new soft-focus lens. Many a novice finds it a difficult problem to focus a sharp lens correctly, even when he can see the difference between "in focus" and "out of focus" on a ground-glass, or on the mirror of a reflecting-camera.

The soft-focus lens and diffused picture are here to stay and, in the hands of experienced workers, they are a splendid means to artistic photographic expression. However, even in the hands of the pictorialist of reputation, a soft-focus lens does not always produce a satisfactory result in the eye of the beholder. With all due respect to the many beautiful masterpieces produced by eminent pictorialists, there are a number of pictures among them that I admit I cannot appreciate or truthfully say that I like. In some quarters, there appears to be a striving for effect at the expense of true beauty and appeal. To say the least, the beginner is no match for the pictorialists that have had years of experience, and possess the necessary photographic equipment. Hence, let him make good, sharp pictures for a time until he is qualified to know exactly what he wishes to do, and is able to do it intelligently and successfully.

From the number of letters received, it is evident that there



THE LONELY RIVER.

C. A. PIERMAN.

is still a strong preference for the sharp, although not necessarily the "wiry" picture. Unfortunately, I am between the upper and nether mill-stones, and eager to do justice to good pictures, whether they be sharp or diffused. However, I must say that in certain cases the camerist is apt to be led to form his opinion by those who express theirs in the most forceful manner.

In photography, as well as in other human undertakings, a man should remain true to himself and to his honest opinions. Because some well-known critic approves a picture does not make it compulsory for me to like it. Of course, my lack of appreciation may be due to my ignorance. The trained critic may see in it a value that I do not; but the fact remains that I like it or not according to the impression that the picture makes upon me.

As I have said before, when an intelligent camerist is master of the fundamentals of good composition and technique, he is then in a position to express his opinion of this or that print; and, in many cases, his criticism is just as valuable and helpful as that of the professional critic with a reputation. All of which brings me to the suggestion that the beginner or inexperienced amateur photographer should not be led to depend on others for his appraisal of the pictorial merits of a picture, or whether it should be sharp or "fuzzy." If he sincerely believes that a sharp picture will serve his purpose more advantageously than one that is diffused, let him stick to it; and if he prefers the "fuzzy" picture, let him say so frankly.

In conclusion, let me repeat that I suggest to the beginner that he maintain strict neutrality between the sharp and diffused "factions" until he can make good, sharp pictures. This accomplished, he should consider well the next step and let him not take it under persuasion or influence of any kind, but solely on the firm conviction of his own experience and study.

When all is said and done, *who really cares whether a picture is sharp or diffused, provided that it tells the pictorial story of the subject as it should be told, truthfully and simply?* Let good old-fashioned commonsense temper our opinions, so that we may be neither too conservative nor too radical. Let us have pictures that speak out the real truth about this beautiful and wonderful world of ours, and those who live in it.



A CALIFORNIA RANCH.

P. DOUGLAS ANDERSON.

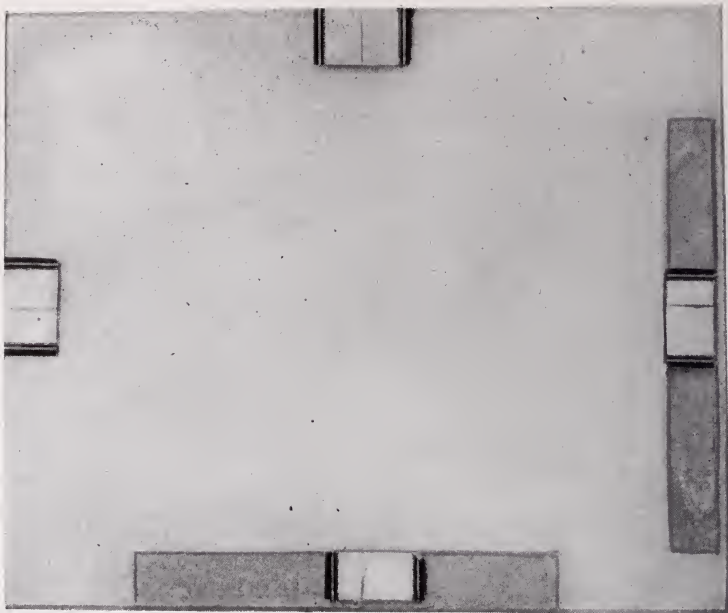


Figure 1.

Illustrating article "A Method of Registration for Multiple Printing"
by William H. Zerbe

A METHOD OF REGISTRATION FOR MULTIPLE PRINTING

By WILLIAM H. ZERBE



O much has been written by capable writers in the photographic magazines about Gum printing, that I hesitate to offer anything on the subject, fearing that what I think is new might be an old story to the readers of the *Annual*. However, taking a chance that my method for perfect registration for multiple Gum printing is new, I will endeavor to explain it, hoping some of the newer gum workers will gain some points by reading it.

Figure 1 is a piece of plain glass somewhat larger than the size of the negative to be printed from. On this glass two narrow strips of glass are cemented to form the angle of a



THE DRINKING PLACE.

WILLIAM H. ZERBE.

true square, leaving an opening at the corner which keeps grit and dirt from collecting there. These strips can be cut from an old cleaned negative. The cement I use is called Spittlers Cement, bought in a Woolworth store. Paper or wood strips could be used, but there is a chance



FIGURE 2

of atmospheric conditions swelling or shrinking them, and this must be avoided if we wish perfect registration.

On the sides, top, and bottom paste a piece of gummed paper where the center of the negative will come. Now, draw a line across in the exact center from side to side, and top to bottom. These marks are shown in Figure 1. Figure 2 shows a negative in place in the printing frame, which, of course,

is larger than the negative used to print from. Care must be taken to hold the negative snug against the glass guides. For this purpose I use a small spring shown in the upper right corner in Figure 2.

The paper to be coated should be of a good quality and one



Figure 3.

that does not stretch much. Either before or after it is coated, the back of it is marked off with a T square, making a line about three-quarters of an inch at the edges in the center of sides, top, and bottom. For this purpose I use a drawing-board which has a line drawn across the center from top to bottom, and side to side. The paper should be about an inch larger than the negative, which allows a half inch margin

to facilitate future coatings. It is tacked on in the center of the board face down, and the registration marks are made with the T square. In this way the marks are perfectly square even though the paper may not be. Besides the registration marks it is advisable to make some distinguishing mark so that the image from the first printing will match the negative at future printings, for some times the subsequent coating may cover the first so that the image can not be seen. I make an arrow in the lower left corner.

Figure 3 shows the printing frame with the negative in place, a piece of coated paper face down and the registration marks made to match the marks on the glass with the guide strips and gummed paper registration marks. These must all be kept in place until the back of the printing frame is brought in place, when it is ready for printing the usual way.

After the print is developed, dried, and recoated, all that is necessary for registering is to lay the paper so that the arrow is in the lower left corner and the registration marks again match each other. This can be done repeatedly for as many printings as one wishes to make.

If there should be any stretching of the paper, it will be from the center of the paper and will be distributed four different ways, and will not be noticeable. Unlike the usual method of registering the negative and paper from the corner of the printing frame, the stretch will be from one point in the corner to the opposite corner, and if large sizes there will be quite a noticeable overlapping of the image in the other printings.

It is not my intention to go into details of mixing the pigments and coating the paper for that has been fully covered by able writers in the earlier numbers of the *Annual*. I do, however, think some advice on multiple printing might be in place for those who wish to try it for the first time.

Be sure to select a good quality of paper, fairly heavy and one that does not stretch. A good test is to cut a strip of the paper that it is desired to use, say about twelve inches long and two inches wide, cut it so that the ends are square. Cut this in half so that you have two strips one inch wide. Now, soak one of these strips in water for about an hour, and then dry. Then compare the length of the two. The one that was soaked will be longer if it is a poor quality of paper.



MEZZOGRAPH

O. C. CONKLING.

For multiple printing use a minimum amount of pigment and coat very thin. My own method is to print very strong with a thin coating of pigment so as to get a good impression of the high lights, printing several times if necessary, and when these and the half-tones are satisfactory, I give a heavier coating, that is, more pigment, giving a shorter exposure so that there will remain nothing but shadows from this printing, the high lights having washed away.

Do not use too dense a negative, nor one that is too flat, although with the multiple printing it is possible to get excellent results with this kind of negative, but it takes quite some experience to mix the proportions of pigment gum, and bi-chromate. To get good results, therefore, I suggest the easiest way for the beginner.



SIDNEY V. WEBB



FLOYD VAIL, F.R.P.S.

SCOTCH MIST.

PHOTOGRAPHING NATIONAL PARKS AND FORESTS

By FRANK A. WAUGH



ALL that has been written, volumes of it, about landscape photography applies to the use of a camera in the National Parks and Forests. At the same time there are important exceptions to be made and special observations which may be of value to the photographer who visits these most attractive fields.

First of all is to be noticed the enormous field offered by these princely possessions. Yellowstone Park is bigger than some of our states, and there are 154 of the National Forests, more than one of which exceeds the state of Connecticut in size. The total area of the National Forests is three and one-half times that of all New England. When we speak, therefore of photographing the National Parks and Forests we have proposed a fairly liberal assignment.

But quality is more important than quantity; and it is not too much to say that for noble and wonderful landscape there is nothing else in the world can surpass the National Parks and Forests of North America, in which group I definitely include Canada.

In fact the tremendous scale on which this landscape unfolds presents one of the primary and most difficult problems to the photographer. The Grand Canyon is a National Park, but anyone who might imagine that the photographic problems in the Grand Canyon were the same as those in Lincoln Park, Chicago, or Schenley Park, Pittsburgh, would be too ridiculous for argument. It is only the simple truth to acknowledge that some of the grandest of this scenery is beyond the reach of photography. In fact it is beyond the reach of painting or of language. The spectacular wonders of the Grand Canyon, the majestic beauties of the Yosemite, the indescribable wonders of the Yellowstone, the somber nobility of the great forests of Oregon, Washington and California, cannot be told in words or picture. Nevertheless they supply the utmost



GRIEF.

Jessie Tarbox Beals.

inspiration for every serious artist, whether he be painter, photographer or poet. On this account the incurable photographer finds it highly worth his effort to visit such scenery, even though he knows it cannot be immediately worked up into picture post cards.

The great diversity of scenery offered in our National Forests and Parks is another point to be emphasized. We have National Forests in the everglades of Florida, on the plains of western Oklahoma, in the White Mountains of New Hampshire, in the Virginia Blue Ridge, in the lake regions of Minnesota and all up and down the western cordilleras from Alaska to the Mexican boundary; and our National Parks are definitely planned to include the most distinct and diverse types of scenery such as the alpine glaciers of Montana, extinct volcanoes, geysers, canyons, waterfalls and the wonderful remains of prehistoric cities. Could a photographer or a painter live for a thousand years he could do no more than make a beginning on the endless program of recording and interpreting the varied scenery of our public parks and forests.

In this connection I should like to say a special word for the National Forests. Quite naturally and properly their scenery is not so widely advertised as that of the parks. The parks have been erected with special reference to the preservation of the most unique and stupendous examples of native scenery. However the photographer well understands that these extraordinary features are precisely the ones which he cannot manage with greatest satisfaction. In order to achieve measurable success he must undertake subjects of less extraordinary size and less extravagant quality. Almost anywhere in the National Forests the photographer will find material amply large enough and sufficiently striking to satisfy all his needs. Another point in favor of the National Forests is that they cover a much wider territory, and are therefore accessible from anywhere. They can be reached by many persons who cannot frequently visit the more famous scenery of Crater Lake, Mt. Rainier and the Grand Canyon. The National Forests are not so much advertised, and a great many persons do not know how accessible they are nor how delightful.

Now, to a great many persons photography is a sport. We hear about hunting with a camera. This usually means going

after moose, deer, and jay birds to steal their photographs by day or night. There is sportsmanship enough about that to be sure; but mountain climbing is also a sporty proposition. So is forest camping or the cruising of mountain trout streams, or paddling a canoe in the Minnesota lakes. On every expedition of this sort the camera must be a companion. It may be a highly incidental accessory and very unintelligently used; or it may be a vital part of the outfit and may yield large returns; it may even be a primary part of the equipment and the photographs which one secures the principal quarry.

Landscape of such boundless extent and infinite variety gives opportunity for every sort of photography. The hand camera will naturally be the first resource of the average traveller, and a good hand camera wisely used will yield very large dividends.

But one may also carry a reflecting press camera. With this he may photograph the half-wild bears of Yellowstone Park and the half-wild cowboys, Indians, sheep-herders, forest rangers and gypsy travellers everywhere in the big country.

Or if one wishes to do what the photographers call "serious work" he will take along his view camera, 5 x 7 or 8 x 10, with tripod, a whole battery of ray filters and every other equipment. He may start in anywhere, and he need not go far until he finds abundant use for all his accessories. Anyone who has seen the photographs of the great Italian explorer Sella, who carries a 12 x 16 plate camera by pack train all through the high mountains of the Caucasus, will be glad that one man has the time, means and ambition to bring the utmost perfection of photography to the service of so noble a theme.

Or again one may wish to use the highly modern moving picture camera. Many successful reels have already been photographed in the National Parks and Forests. Yet only the smallest beginning has been made. A thousand wonders remain untouched.

Finally I would say that the practical problems of photography in the big parks and forests are simpler than we have been given to understand. I have photographed clear across the country from Maine to California and from Canada to Mexico, but I have never found a locality where the ordinary hand camera will not do full service.

We have often been told about the extraordinary intensity



HER JEWEL.

LOUIS ASTRELLA.

of light in high altitudes. I think this point has been overstated. One does not need to reduce his exposure very much in working with a hand camera; and anyone who knows how to handle a tripod-camera, with or without an exposure meter, ought never to be at a loss.

Ray filters and cloud filters (I prefer the latter) are highly desirable in the west, in the mountains, at high altitudes, and especially when photographing glaciers and snow fields. Still one can get along without these accessories even on Mount Hood, or in the New Mexican forests. Of course he ought to have a sky filter even on Chesapeake Bay or in Franklin Park, Boston.

One of the most important considerations from a practical point of view is to develop one's exposures about as fast as they are made. It is a great mistake to go on a long trip through the parks and forests and reserve the development and printing of films until one is safely home at the end of the season. It is always desirable to know how the game is going. Various re-adjustments of focus and exposure are desirable, and these can be made only in view of the finished photographs. The stranger going to the parks or forests should, therefore, be prepared either to develop his own negatives as rapidly as made, or else he ought to turn his films over to a good commercial operator and find out at once where he stands.

No one can realize until he has travelled over the big parks and forests how universal our American photographic service is today. I have frequently been to the most remote sections of the United States, but I never yet reached the point where I could not get films developed within twenty-four hours, if it were necessary.

Considering, therefore, the fact that these big examples of scenery in the National Parks and Forests, not to speak of State Parks and Forests, are to be found almost everywhere, that this landscape is beyond comparison in extent and variety, that it presents no unusual or insuperable photographic difficulties, and that a universal photographic service follows one wherever he goes, it would seem as though every owner of a camera of whatever sort, would turn his face early toward these incomparable museums of native landscape.



TWILIGHT.

HAROLD K. FREDERICK.



WHEN DRIFTS LIE DEEP.

GEORGE W. FRENCH

WINTER WORK

By GILMER WINSTON

MANY camera workers are in the habit of doing photographic work in the summertime, and discontinuing such work as soon as the fall and winter months come on. Anyone who does this will not gain his full measure of pleasure from the use of the camera, and the object of this article is to encourage the use of the camera throughout the winter months.

The ideas expressed here have been gathered from various sources and have given the writer much pleasure. The work



A PLACER MINER'S OUTFIT.

GILMER WINSTON.

contemplated is that of making large pictures colored in oil colors, which may be copies of paintings or other colored pictures, or which may be original landscapes colored along the same lines. It is better in the beginning to make copies of colored pictures, for the reason that the color scheme can be followed, thus leading up to original coloring of other pictures.

Of course, it is not contemplated that anyone should make use of copyrighted material without first obtaining proper permission. This should be borne in mind before any pictures are disposed of or allowed to go out of the hands of the maker.

No particular apparatus is needed other than a good ray filter, and possibly a portrait attachment for use with the kodaks. The writer uses a Graflex camera and a No. 3 Wratten filter. For copying material good copies of paintings may be obtained from any art store at a very nominal sum. The first step is to obtain a good clear negative of such paintings. The writer has found that with the use of a No. 3 Wratten filter and a full exposure a good clear negative can be obtained by using the regular tank development with standard Pyro powders. Both film packs or plates give good results, and there is no reason why roll film should not give equally good results, provided the camera is first focused accurately, and the distances marked, so as to avoid focusing between each exposure.

After the negative is obtained an enlargement is made on some paper suitable for oil coloring. The writer's preference is a paper of smooth surface such as Velvet Velox, or papers of similar character. The smooth matte surface papers are also very suitable, though they require more preparation than the hard surface paper. For coloring the following materials should be provided:

A package of Lintine which can be purchased from any drug store for 10 or 15 cents.

A little Megilp or Linseed or Poppy Oil and a small bottle of Turpentine.

In using hard surface papers, no preparation is really necessary. In using the softer papers, it is well to take a small piece of Lintine and apply to the surface of the paper a little of the medium diluted with Turpentine. Then, take another piece of Lintine and wipe off all surplus medium.



AFTER THE SHOWER.

Wallace Lumney.

The colors necessary need be but few and for experimental purposes, the following will be all that is necessary: Yellow ochre aureolin, cobalt blue, rose madder, burnt umber and flake white. The method of coloring is as follows:

On a small piece of Lintine put a very small amount of color direct from the tube, and rub over the picture wherever color is needed. It is best first for experimental purposes to take just a little yellow and rub into the lighter parts of the picture. Take just a little cobalt blue and rub into the shadows, afterwards blending a little rose madder into this blue, thereby forming a purple for the shadows. The colors can be easily blended on the paper itself and wonderful results can be obtained.

In preliminary work, it is well to follow the color scheme exactly of the picture used as a model. Afterwards this same color scheme can be applied to original pictures of similar character. Some beautiful results can be obtained by coloring in this manner copies of Van Ruisdale's "Mill," and Corot's "Dance of the Nymphs," or well known pictures of similar character.

One need not be afraid of getting a color on wrong, for a piece of Lintine moistened with Turpentine will easily remove every bit of the color so that one can start fresh.

This is work that can be done in the house, and is of very absorbing interest. It is a good method to use in learning to color pictures and it leads to higher things. Probably some of the older artists would turn over in their graves were they to know how the writer obtained a drawing on canvas of one of his pictures, but it was done by reflecting a negative direct on the canvas with an enlarging apparatus, and the outlines of the picture were traced direct on the canvas. The shadows were marked with charcoal. Then, the picture used as a model was placed by the side of the canvas and each stroke as shown in the picture was placed in proper position on the canvas. Some copies of pictures that are obtainable from art stores very clearly show the artists' strokes and form excellent models for such work. Wonderful results can thus be obtained, and an endless amount of pleasure and amusement afforded.

PICTURE TAKING AT HOME

By GEORGE STEELE SEYMOUR



THE American should not seek to take his camera abroad in search of the picturesque until he has first tested the possibilities of his own country. "Snap America First" is a good precept.

In the course of more than twenty years as an amateur photographer—of the raw "button pushing" variety—the writer has accumulated negatives from nearly every state in the Union. The result of all this experience is the old familiar truth that pictures are to be found everywhere; that the north-west corner of your armchair is as likely to yield a prizewinner as some feature of landscape that one travels miles to see. Lines exist everywhere, and if you put them in the right places, why, there you have a picture.

That is all right in theory, but in practice we often need the inspiration of mountains, rivers, the sea and the sky. At the same time that we are garnering our photographic crop, we are enjoying the outing. At the imminent risk of being elected to membership in the Ten Best Club, I shall name as the places that have seemed to me richest in photographic material, the New England coast; New York City; Niagara Falls, where every photographer goes at least once in his lifetime; the island of Mackinac; New Orleans, especially the older and less tidy parts; the east coast of Florida; old Santa Fé; the region around Colorado Springs; Seattle and the places that can be reached from it; San Francisco.

There you are. Ten; count 'em. Why have I left out the Yellowstone and the Grand Cañon and other places where the photographer has to have special lenses and equipment, and has to suspend himself from the side of a precipice? I don't know. It is just my choice. I give it to you without explaining how or why.

Here are pictures from some of these picture places. Niagara is the old faithful; her wonders are ever at the photographer's service. On each visit I find some new region to explore and photograph. Every stone on the Goat and Three



A LANDSCAPE AFTER COROT.

GEORGE STEELE SEYMOUR.

Sisters will give up a picture, while the lower level, reached by stairs and elevator and ruled over by the two Maids of the Mist, presents an aspect undreamt of by him who stays on the heights. Last summer I took my camera for its first visit to that tangle of rocks and overgrowth called the Glen. Not all visitors discover the Glen, but there is a fascination about strolling there; you feel that nature is trying to baffle your attempts at photography. The many nooks and corners are problems in exposure. You will come upon two rocks thrown together by the elemental forces, and the path crowds through the narrow space between them as they lean against each other. How are you going to take a picture of that piece of natural architecture? Try it if you dare, or turn instead to the wildflower growing in a rocky niche at the bend of the path where the sun shines brightly.

But the greatest picture of all at Niagara is the Falls themselves. There is always mist, but also there are moments when the wind blows the mist curtain aside and the water stands out clear. Through showers of spray, on the little boat that pushes close to the danger line, I managed one day to get a shot at the American Fall and the rock at the foot of it that is called after the ages. How many times has this same picture been taken; but will we ever get tired of looking at it?

Like Niagara in its supreme quality as a play place is Mackinac, guardian of the Lakes, an island paradise of water and sky. I do not know any more beautiful sight than the blue universe that stretches out all around you on a clear day. To stand on the palisades amid trees and flowers and gaze out over miles of water, with glimpses of little unspoiled islands and perhaps a tiny village of clean, white houses—this is a city person's dream of paradise.

It is all good picture material at Mackinac, the grand views as well as the tiny details. The air has that transparent quality found in Colorado and other high places. It is clean air and calls for speed and small stops. The clouds are wonderful and you will get them in your negatives if you want them. A sunset behind thick clouds across the water is an interesting subject.

Mackinac is an old fur-trading post, and in the whitewashed fort and quaint village are many picturesque nooks. There is an old blockhouse built back in the blockhouse days, and there



THE ETERNAL.

GEORGE STEELE SEYMOUR.

are rock formations, woods and roads winding through them, to keep your camera busy. This is the last remaining spot of earth's surface where automobiles are not admitted. It has long been my ambition to catch a sailboat right under the arch of the Natural Bridge, as you look out from the land side into Lake Huron. It can be done, and what an immense amount of satisfaction one would get out of it!

From Mackinac our pictures fly west. Colorado is the land of sunshine and mountains. To see the mountains properly you must stand on the plains and look off at them. Once you are up among the peaks, you lose the sense of their presence. On account of the elevation and consequent rarity of the air, exposures must be made rapidly. In the ordinary sunlight your anastigmat works at .16 stop and 1/100 exposure. On clouds or distant views you can stop down to .32. The problem is not how to get enough light, but how not to get too much. I usually go to Denver or Colorado Springs and excurt to and from the mountains. Estes Park is a beautiful play ground; the Cañon of the Arkansas and its famous gorge is impressive; at the Springs we are in the shadow of that Peak of Pike's, an unfailing object of interest. Colorado Springs is doing much to redeem itself from the charge that it is devoted to exploiting the tourist; the Garden of the Gods is city property and admission is free to all, while North Cheyenne Cañon, a jewel of great natural beauty, has been fitted at considerable cost with a fine new automobile road which gives many delightful views.

From southern Colorado you can narrow gauge, if you like, down to Santa Fé, the venerable, the historic. Everything here is of a past age, even the little train that brings you down from Antonito, puffing through Indian villages along the upper Rio Grande.

If you would go out to the Indian pueblos, and especially to Taos, as painters are fond of doing, you would find marvelous subjects.

And just to show that this is not entirely travel bureau stuff, I am including in the exhibit a bit of scenery labelled "Landscape After Corot," which was caught amid the smoke and grime of our very practical city of Wilmington, Delaware.



IN THE LAND OF SILENCE.

STEPHEN H. WILLARD.

DESENSITISERS

By MARCUS G. LOVELACE, B. A., Mus. Doc.

T is only in the last year or so that there has been any real results on the use of desensitisers, although many of the German photochemists and physicists have been experimenting more or less for years. Luppo-Cramer has done more than almost any although some of the early researches of Vogel who was the discoverer of orthochromatism, seem to suggest that he had had some of the results that have given such remarkable results with Dr. Luppo-Cramer.

The possibility of destroying the sensitiveness of an emulsion offers so many inviting possibilities, that the first thought of the process is rather dazzling—think of it—take an exposure, bathe it in a given solution and then develop in daylight. It sounds wonderful, and for many purposes may be of immense value—as far as producing any superior results over the time and temperature method I am inclined to doubt. What is really the action of a desensitiser on the image, of course, no one really knows, any more than they know what a photographic image is itself. One theory seems to be about as plausible as another and as far as proof goes, one is as easy to prove as the other for neither has ever been demonstrated with any reasonable certainty.

The desensitisers are not to be confused with the various red-dyed developers that have had a greater or less vogue in years past. They are true desensitisers, destroying the sensitivity of an unexposed silver bromide emulsion, reducing their degree of sensitiveness to about $\frac{1}{2}$ of 1%—more or less. From all indications the action is due to oxidation products formed in the developer as some developers act in this way if used on unexposed plates. Amidol in particular in a solution of about $\frac{1}{20}$ of 1% will reduce the sensitiveness of unexposed emulsion to about $\frac{1}{200}$. Tri-amido-toluol will reduce it to about $\frac{1}{600}$. Ordinary plates treated in this way may be developed by a bright yellow light without fog. Of course, some of these desensitisers will not work on ortho plates, or panchromatic—some will.



STUDY IN PROFILE. MISS FALES.

Lou Sweet.

The most remarkable effects, however, have been obtained with saffranine, or rather pheno-safranine, and tolu-safranine, although safranine itself is marketed abroad under various names for the use of the operator in working in bright light. A bath of 1 part of dye in 2000 water used for a few minutes before developing will reduce the sensitivity of ordinary plates to a point where they may be developed by a fairly bright light without any danger of fog. The dye may be added to the developer—or may be used as a preliminary bath—either way being perfectly satisfactory.

The use of safranine in a hydroquinone developer changes its characteristics almost entirely—causing it to behave like metol, the image flashing up and requiring several times the development that it would have required with plain hydroquinone. On the other hand the Watkins factor of pyro is reduced and that of amidol as well. As far as practical operations go, I suppose it is necessary to give specific figures, and I am afraid names.

I have had an unhappy faculty in the last few years of giving names of materials in the *Annual* that none of its readers seemed to be able to obtain, and been forced to answer many letters every year giving addresses of firms dealing in the materials given. This year I am going to say that in every large city there are firms who make a specialty of chemicals and apparatus for laboratory use, and they can furnish any of the materials given in this article. If this will not do and the editor will allow me, I will say that while there are many firms, I have never had any trouble in getting what I wanted through Eimer & Amend of Philadelphia. Pheno-safranine is a red dye, soluble in water and alcohol; for our purposes water is the most suitable solvent, especially in the partly-dry country we live, as most of the alcohol obtainable is unfit for any use, except suicide.

A solution of a strength of 1 gram in 2000 cc. of water, may be added to the developer in use, in the proportion of about 10%. The plate is immersed in total darkness, or by a deep red light and after about half a minute, a bright yellow light may be used for the completion of development. The action of the dye is not that of the old dyed developer, as it produces the same effect if the plate is bathed in the solution, and then well washed to get rid of the dye stain.

It is sometimes rather difficult to get rid of the color of the dye and prolonged washing is often necessary to do so. In case this gives trouble, the plates may be fixed and well washed, and then bathed in the following:

2% Alum solution 1 part

5% Hydrochloric Acid 1 part

Give two or three changes of about two minutes in the above solution and the dye will wash out without much trouble.

Another stain remover—

Sodium NITRITE (not nitrate) 5 grains

Hydrochloric acid 10 drops

Water 2 oz.

Bathe in the above for about four minutes, and then wash for five minutes. Simple washing will remove the dye in most cases and is preferable.

Ilford's of London, market a form of safranin suitable for use with ordinary, ortho, or panchro-plates, under the name of "Desensitol."

Lumiere's have done a great deal of research on this subject, and Lumiere and Seyewitz had a paper in the British Journal of Photography last year giving their results. Many dyes and substances were found which had remarkable desensitising properties—Apomorphine hydrochloride—Aurantia—Picric acid—Indian Yellow—Chrysoidine, and Potassium Chromate.

When it is not required to examine plates by transmitted light, such as autochromes, a 1% solution of picric acid—a 1 in 2000 solution of chrysoidine, or a 2% solution of neutral potassium chromate may be used for about half a minute in the dark—obviating the staining qualities of safranin. The plates after bathing may be developed about five feet from a candle. The above mentioned desensitisers may be used with bromide paper which is so badly stained with aurantia or phenosafranin that it is almost impossible to remove it.

Now for some developer formulæ. First an old friend.

A Sodium sulphite 100 grams

Hydroquinone 12 grams

Potassium Bromide 1 gram

Water 1000 CC

B Potassium Carbonate 50 grams

Pheno-safranin (1:2000) 200 CC

Water to make 1000 CC



ALLEY SILHOUETTES.

PETER G. PETRIDIS.

Use equal parts, A & B. This is a very quick soft working developer much resembling metol.

Paramidophenol

Potassium metabisulphite	50 grams
Paramidophenol hydrochloride	20 grams
Potassium Bromide	4 grams
Water	125 CC

Dissolve 70 grams pure caustic potash in 90 cc of water, and when cold add slowly to the first solution—much heat is developed and the two solutions should be mixed *slowly*. To each 200 cc of the completed mixture should be added 10 cc of a 1% solution of phenosafranine. The mixture will be turbid, and must be shaken well before using. One part of this mixture should be diluted with about 20 parts water for use.

Metol hydroquinone developer (single solution) with about 10 cc of pheno-safranine solution (1:2000) to each 100 cc. of developer will work perfectly, and will keep very well if kept stoppered.

Some persons are troubled very much with working in the dark, even with the modern methods of illumination, and while time and temperature will do better work than any man can do—(in the final average of his work) many of us like to see the plate in the developer and detest a red light, or begrudge the time that it takes for the retina to accommodate itself to a grey-green safe light. For these the new method should prove something well worth while. I have not tried it on Autochromes, but from the foreign journals, it works well, and should be a real boon to those who work with this most fascinating of all plates.



O. C. CONKLING.

A PHOTOGRAPHIC KITCHEN CABINET

By F. R. SEAVEY



LIKE most amateurs I had always been obliged to perform all my photographic work on the kitchen table, or in the bath room, with all the attending inconveniences, storing apparatus and supplies in various drawers, trunks, and closets; the whole operation entailing much time consuming labor in hunting up the various apparatus and preparing for operations, and afterward in packing things away again; not mentioning the inconveniences to the other members of the household.

Like most other aspiring amateurs, I always longed for the day when I would have a room all to myself, a day which never seemed to come. I had often noticed the great convenience which the modern kitchen cabinet is to the house wife, how she can perform all cooking operations without leaving her seat on the stool with all her paraphernalia within easy reach before her, and the thought came to me why not a photographic cabinet along the same lines?

From the lumber of some packing boxes I built the cabinet shown in the illustration (Figures 1 and 2); four and a half feet long, six and a half feet high, with the table top or working surface 30 x 54 inches in size, and at a height convenient for work standing or seated on a stool. While not handsome as a piece of furniture it has proved very useful.

Referring to the illustration, the cupboard on the right above the table top contains, scales, graduates, chemicals, etc., and from this section all solutions are compounded. On the inside of the door are pasted all the formulæ which I regularly use. This compartment has a tight partition separating it from the other compartments to the left, and has ventilating holes in top and bottom, so that any chemical fumes which might accidentally get loose will not penetrate the other compartments and damage materials there.

The lower compartment on the right contains trays, tanks, etc., and is likewise ventilated. Thus, all wet operations are performed on the right-hand end of the working surface.



Figure 1.

Illustrating article "A Photographic Kitchen Cabinet," by F. R. Seavey.

The remainder of the space above is not divided, but is one large compartment with double doors. Here are kept paper, films, printing frames, trimmer, and the thousand and one things which accumulate, which the amateur considers indispensable and wants kept where they can be found without delay.

The large double compartment below to the left holds the

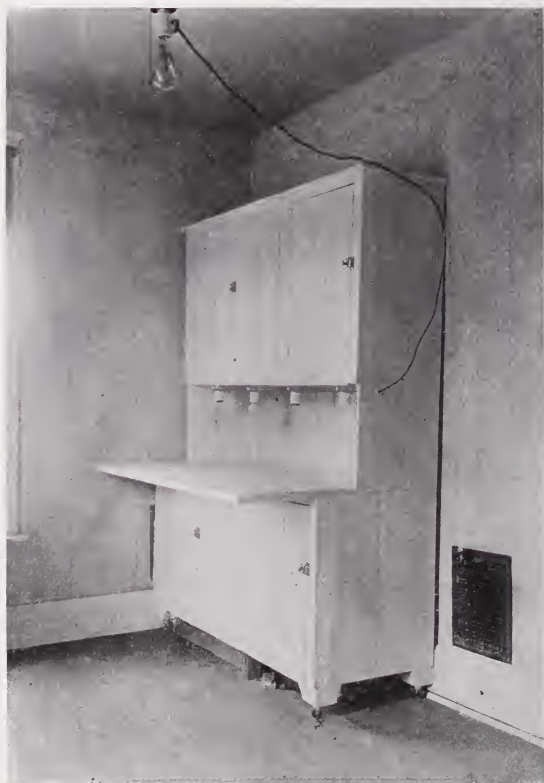


Figure 2.

enlarging camera, tripod, camera, and all bulky packages such as stock of mounts, etc. All of the compartments have shelves spaced to accommodate the various articles.

A removable partition divides the working surface into two parts. Developing and other wet operations are performed on the right-hand end, the partition preventing any spatter from reaching the dry operations on the left end; for while



A NORTHERN SUNSET.

J. A. SINGLER.

the careful workman does not splash his solutions about, accidents sometimes happen, and with a few old newspapers under the trays and this separating partition, an overturned tray is not likely to cause the regrets which follow the loss of cherished negatives or other materials.

In the left-hand part of the working top is a removable section where the printer fits in. This is an Ansco Amateur Printer which has had the original single lamp socket replaced by two sockets, and the box lengthened out so that the lamps are at a sufficient distance from the negative to secure even illumination. Two 75 watt bulbs are used for slow printing papers, while smaller bulbs are substituted when working more sensitive papers. This arrangement gives all the printing speed that the amateur needs. The printer is held rigidly in the opening in the table top by two small L shaped pieces of thin iron screwed to the printer and thumbscrews passing through them into the under side of the table top; the removable section of the table top being secured in place in the same manner when the printer is not in use.

Above the working surface are four electric light key sockets on a wire circuit which is connected to the electric fixture in the center of the room by a removable plug on a flexible lamp cord. To these sockets various lights and devices are attached. To the one on the left, the printer, or when using a printing-frame a 100 watt bulb; in the next socket generally a 25 watt frosted bulb which is switched on when a white light is desired on this end of the table, for such uses as examining negatives, adjusting masks, etc. In the next socket, which is near the center of the working surface, is a ruby bulb when needed, or when printing ordinary papers a shaded bulb with orange paper over the bottom of the shade.

This light and shade are supported by a small rod passing through a small pivoted block on the underside of the upper compartments. This rod can be pushed in or out and swung from side to side, thus bringing the orange light above any part of the working surface. In ordinary printing operations this light is adjusted right over the dividing partition so that it illuminates both sides, and being shaded it casts the light downward where it is needed and not into one's eyes. The fourth light socket on the right carries a 25 watt frosted



LAKE GEMESCAL.

EDGAR A. COHEN.

white bulb, and being over the hypo tray comes handy to have a look at the prints while in the trays.

When making enlargements, a homemade enlarging camera is clamped by thumbscrews to the door of the upper compartment on the left, and shoots downward, the sensitive paper being laid on the table top and held down by small weights on the edges of the paper.

The entire upper part of the cabinet above the table top can be removed by taking out a few screws, this making it easier to handle in case it is necessary to move it to another room, while large wheel casters make it easy to move for cleaning or sweeping under. The entire cabinet is painted with white enamel both inside and out, thus being easy to clean.

While such a cabinet lacks the advantages of running water, it being in a room next to the bath-room, it is but a few steps to the water faucet, and the prints are usually taken into the bath-room for final washing.

The great advantage of the cabinet is that it keeps all photographic goods together ready for immediate use without the loss of much time in preparation and cleaning up after operations, and occupies only a small space, thus leaving the balance of the room to be used for other purposes.



W. T. STARR.



ENCHANTING TOWERS.

IRVING BERKEY.

THE CARBRO PROCESS

By NOËL G. BREEZE



At the present time when the art side of photography is at last beginning to receive such well merited attention, many serious workers are looking around for a process which will allow them to give full rein to their artistic abilities.

Many workers have realized that in Carbro they have at hand a process which will allow them to indulge their ideas in full, which is simply a method of making Carbon prints without the bother of printing with an Actinometer extraordinarily simple to work and also comparatively cheap.

The working details are as follows:

A bromide print is taken and soaked in water. Prints on a smooth matt surface give the best results, and it should be remembered that wherever the term bromide print is used the same remarks apply equally well to gaslight papers.

A piece of insensitive Carbon tissue is taken and soaked in the following baths:

No. 1. Stock Solution

Pot. Bichromate 1 oz.

Pot. Bromide 1 oz.

Pot. Ferricyanide 1 oz.

Water to 20 ozs.

No. 2. Stock Solution

Formaldehyde, 40% .22 ozs.

Glacial Acetic Acid . . 1 oz.

Hydrochloric Acid

(pure) 1 oz.

For use take No. 1 6 ozs. water 18 ozs. No. 2

1 oz. water to 32 ozs.

The two dishes containing the two working baths are placed side by side, and the tissue placed in the first bath for 3 minutes exactly, lifted out by the corner and allowed to drain for 15 seconds. It is then transferred to the No. 2 bath, and the time in this bath is governed by the results desired. The longer it is in, the softer will be the finished results and vice versa, so that if we are working with a very hard print and require a softer result, all that it is necessary to do is to give a longer immersion in the No. 2 bath.

The minimum time is about 8 seconds; the maximum about 30 to 35 seconds. If this second bath is omitted altogether it



LUCILE.

MACAVOY SISTERS.

will be found that the finished print is so heavily clogged as to be useless.

The tissue is taken from the No. 2 bath and placed on the bromide print. The bromide print must be previously placed face upwards with plenty of water on the surface. As soon as the Carbon tissue is brought into contact with the bromide print care must be taken that it does not slip, and it must be squeegeed firmly into contact with a flat squeegee as soon as possible.

This operation of squeegeeing into contact is best done on either a piece of glass, or on a special board for the purpose which has been varnished with a good transparent waterproof varnish.

The two are left in contact for from about 12 to 20 minutes—about fifteen minutes being a good average working time.

When they have been in contact for about twelve minutes a piece of specially prepared support paper is taken, soaked in water for about two or three minutes, and placed face upwards on another piece of glass or board.

The bromide and carbon tissue in contact are now taken from the squeegee plate, and the carbon tissue stripped away. The Carbon tissue is then placed on the support paper and firmly squeegeed into contact. It is then placed between blotting boards and left for about half an hour under just *sufficient weight to keep it flat*. Great pressure besides being undesirable is also inconvenient. The bromide print at this stage may be placed in a dish of water to wash and left until we are ready to deal with it.

The next stage in the process is the development of the Carbon print, and for this all that is required is a kettle of hot water. A fairly large dish should be selected, as this gives plenty of room to work, and greatly facilitates the work. The exact temperature of the water is immaterial, but it should be somewhere about 110° F. If at all doubtful start with the water too cold, as it is quite easy to warm it up, whereas if it is too hot, frilling and blisters will probably result.

The tissue and support should be placed in the dish well under water and allowed to remain so for about ninety seconds. It will then be seen that the pigment is oozing all round the edges of the print, after about another thirty seconds the



SHEEP IN THE BERKSHIRES.

C. R. Phipps.

backing paper can be stripped bodily off, leaving all the pigment adhering to the support paper.

There are two alternative methods of development in general use; the first and, in the writer's opinion the best, is to lay the support paper face downwards on the surface of the water and gently draw it backwards and forwards on the surface of the water. Continue this as long as any pigment continues to wash off the surface of the print. When no more pigment will wash away the picture is developed. The other method, which may be preferred, is to lay the print face upwards on the surface of the water and gently splash it with the one hand whilst steadying it with the other one. Considerable control at this stage can be effected in this manner.

After development the print should be allowed to stand face downwards in a deep dish of cold water for about five minutes to thoroughly discharge any undissolved pigment. It may then be either treated with an alum bath, or not, according to the taste of the worker. Treatment with an alum bath discharges all the potassium bichromate which may be left in the print and renders it absolutely permanent.

Perhaps at this juncture a few general hints on the manipulation at the various stages may not be out of place.

To begin with, whenever doing any squeegeeing, always use a flat squeegee, as the use of a roller squeegee, except in the hands of an expert, tends to make the pigment deposit in waves across the print, instead of an even distribution all over. It is also a good plan when sensitizing the tissue in the first place to press the tissue firmly down on to the bottom of the dish in the No. 1 bath, immediately lifting it up again and well rocking the dish until it becomes limp, thus preventing the formation of air bells on the print.

Air-bells, or small air bubbles, are very liable to occur unless precautions are taken, and to have to spend time in spotting out some hundred minute flaws is, to say the least, a great inconvenience.

The easiest way to prevent these occurring is to splash plenty of water on to both the surface of the bromide and the support paper at the various stages. It is obvious that if there is plenty of water on the print that, as the squeegee moves across, it will take the water with it, and that this will at

the same time move any small bubbles along with it: if there is not enough water there the bubbles will simply be flattened out between the paper and appear as small white spots in the finished print.

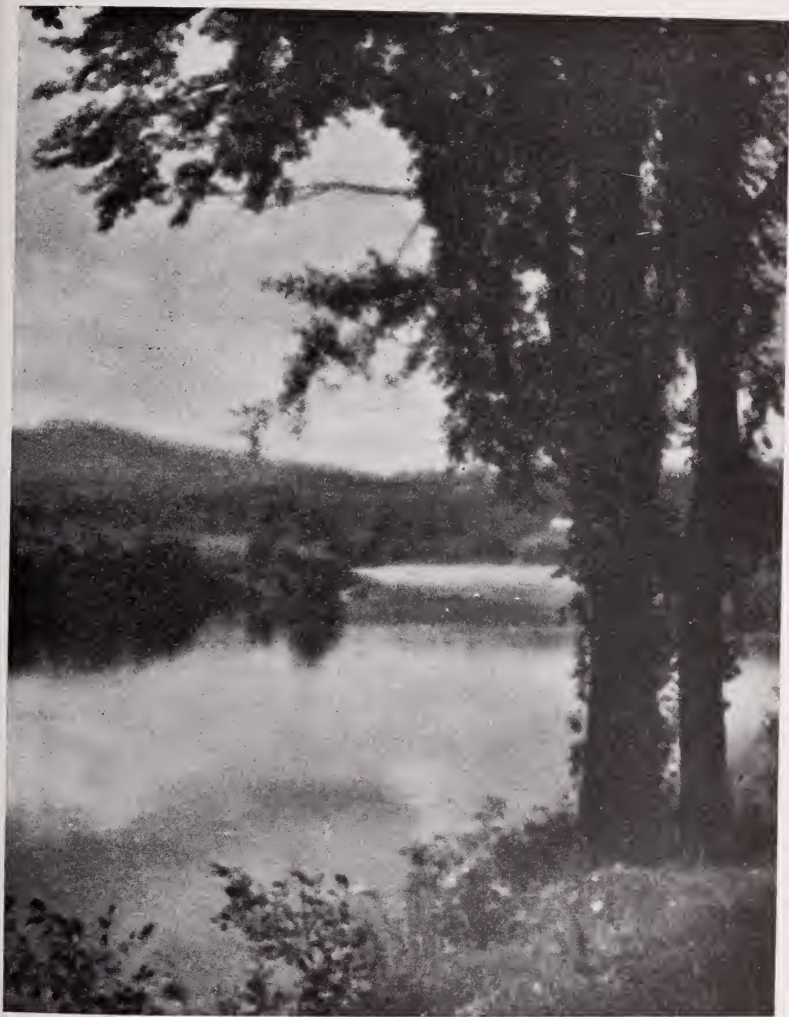
With regard to the length of time for soaking the final support paper, there are a great many different opinions on this, but the writer has always found that even with the heaviest support papers only about three or four minutes at the most are necessary.

A very good method of preventing slipping during the operation of squeegeeing the Carbon tissue into contact with the bromide is to have a hinged flap on the board fitted with a piece of rubber along the edge. This is just pressed down along the edge of the print and holds them firmly during the operation. Care must, however, be taken to see that it is not pressed down too hard, or surface markings due to the weight will appear on the finished print.

It should be clearly understood by the worker that in the first operation of sensitizing the tissue that absolute adherence to the time given for immersion in the first bath, namely three minutes, is essential, and no mistake must be made over the fact that it is in the second bath that the time must be varied to obtain control.

The bromide print, which is still in a bleached state may now after it has been well washed be redeveloped. For this any non-staining developer may be used such as Metol-Quinol, Amidol, etc. The redevelopment must be very thorough, fifteen minutes at least, otherwise succeeding Carbro prints will lack detail. In fact if the redevelopment has been very short it may not be possible to obtain any further Carbro prints from the bromide. Any number of prints may be made from the one original bromide without any loss of detail, in fact the writer has one in his possession from which some forty-five prints have been made during a period of two years, and the bromide is still in perfectly good condition.

The length of life of a working bath is always a matter of interest. The life of the No. 1 bath is practically indefinite. After it has been in use for some time it will probably give a very harsh print; this is a sign that it is exhausted. The No. 2 bath should be renewed very frequently as the constant



A BIT OF THE ANDROSCOGGIN.

W. T. STARR

additions of potassium bichromate to it from the No. 1 bath soon exhaust it. As a rough guide about six to twelve whole-plate prints will exhaust a 32 oz. working bath.

Those workers who have been in the habit of working the old Carbon process will be quick to appreciate the enormous advantages for many reasons, the chief of which is that it does not matter what size of Carbon print is desired, all that is necessary is to make an enlargement of the required size and to make a Carbro print from this in the manner described.

Another advantage which cannot be too strongly emphasized is that the old and troublesome double-transfer process is entirely done away with. The reason for this is obvious. When the tissue is placed in contact with the original print it is transferred one way, and when in its turn the tissue is placed upon the support paper it is transferred again, thus making a double transfer. Only those workers who have tried double transfer work and spoiled an otherwise good print at this stage will be able to appreciate the advantages of this to the full.

An easy way of securing local control is to have by the side of the developing dish a small jug containing water which is practically boiling; with this any part of the print which it is desired to lighten may be treated by dipping a piece of cotton wool, or a sponge, into the jug and directing a stream of hot water on to the part which it is desired to lighten. Another method of lightening heavy shadows is to gently brush them with a *very soft* artist's water-color brush dipped in the jug of hot water. It is only a matter of time before the worker can practically make the finished result just what he requires.

In conclusion the best advice is to follow the instructions exactly until you have absolutely mastered the working of the second bath. Do not start experimenting until you have grasped the main details; when you have done this the rest is easy.

After a short time it will be found that you can produce just the result you want by means of this fascinating process, and from a pictorial point of view these are unsurpassed. For one thing the results have a magnificent quality which no other process can give, and for another there is a choice of some thirty-six colors, so that the color may be suited to the subject.



PRIDE OF THE RANCH.

LOUIS FLECKENSTEIN.

TODAY VS. YESTERDAY

By C. H. CLAUDY



AMONG my earliest recollections is having agreed with my parents to save up my pennies to buy a Kodak. The Kodak of those days cost twenty-five dollars (about equal to seventy-five now), and for a boy of ten to agree to save up to buy it was an insane promise! I realized this more and more as the months went on, and the fund grew so slowly it hardly could be seen to sprout!

I suppose I should be saving up for that Kodak yet, if some one had not taken pity on me and given me a camera!

The camera (this was thirty some years ago!) had a single lens, working, I suppose about F/16, used dry plates, and I printed on albumen paper, toning in a gold bath. It used to take about three weeks to save up money enough to get a minute vial of gold chloride, I remember!

Well, in after years I owned other cameras, even Kodaks. I watched the process of manufacture change from the first clumsy film instruments at large prices to the modern fool proof Brownies and Kodaks at next to nothing in money. I watched the albumen paper give way to Solio, Solio give way to Velox and Velox change from its early difficulties to its fool-proof present.

Twenty years ago I tramped the country with a heavy camera and many dry plates. Twenty years ago there were films and Kodaks, of course, but a lot of us refused to be educated to the point where we either could use, or believed we could use, the simpler, lighter apparatus to the same good effect that we could the heavier, older styles.

Now, of course, I would no more think of carrying around an eight by ten with loaded holders than I would think of trying to race on a bicycle against a motorcycle. The heaviest outfit I ever carry now is a Graflex, and that is one of the smaller film models.

I dare say you are about ready to give up in despair and turn to a story with more point, so I hasten to introduce the point of this one.



LITTLE BROTHER.

C. A. TELFER.

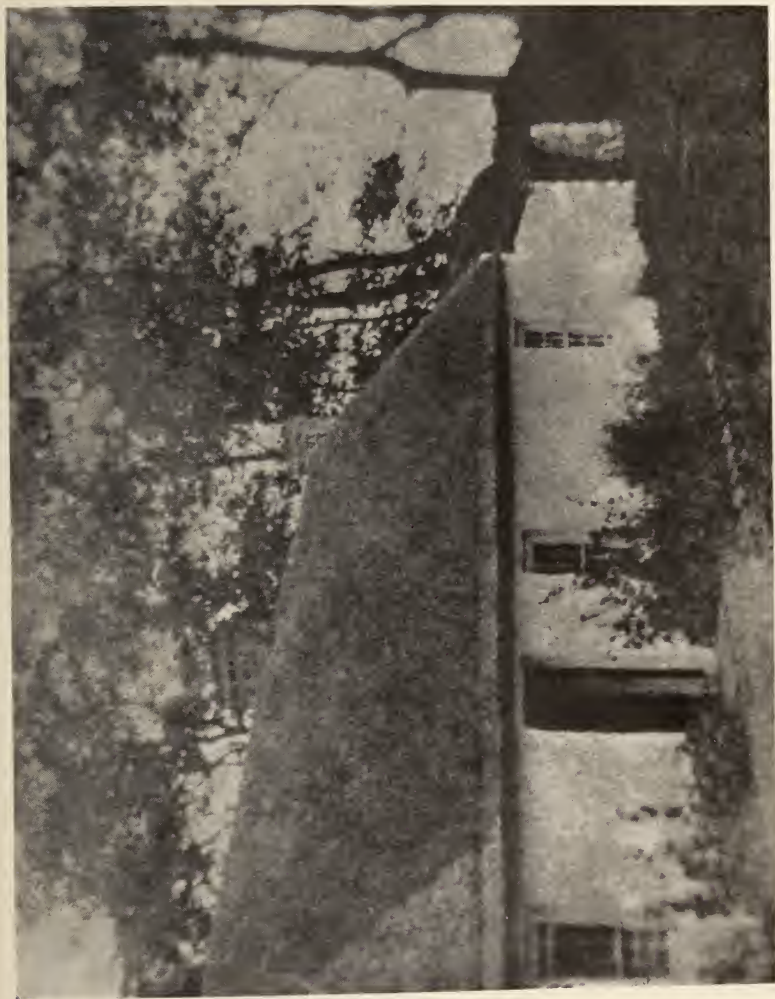
So many people have written about the convenience of modern photography; the ease of carrying Kodaks and films and the lack of effort required in development and printing, as opposed to older days and older methods, that the photographic world is pretty well convinced that the great boons of pocket Kodaks and roll films is one of muscular saving and surcease of trouble.

I think we miss the point when we put the emphasis here; to me, the great advantage of the modern system of photography as worked out for the amateur, the vacationist, the pleasure seeker, the historian and the traveler, is not a matter of *muscle* but of *mind*.

We have been freed from the mechanics of our art. That leaves us free to put our entire attention upon the art. In olden days the traveler from New York to Boston faced a difficult, dangerous and tiresome journey by stage coach. His thought was for pillows and rugs, something to eat, a gun for protection. He had little time or inclination to spend upon the object of his journey until it was accomplished. Today the business man gets on a train, dictates his mail as he goes, sends telegrams *en route*, and hardly knows at the end of a few hours that he has not been at home in his office. He has been freed from the mechanics of his journey, and his thought can all be for the object of the journey.

The object of the photographic journey which a roll of film makes, through Kodak, developing tank, printing frame and chemical baths, is to produce a picture. If all our attention is concentrated on the means, we have little for the result. Look at the photographs of thirty years ago, and see the contrast with those of today; they are, many of them, perfect as photographs, and with the same pictorial appeal as may be possessed by an architect's drawing of the floor-plan of a storage warehouse!

Look at the vacation photographs of today as compared with those of yesterday. Then, we had stiff groups, laborious compositions of country hotels with John and Katherine holding hands on the "piazza." Today we have little intimate pictures, walks, rides, picnics, the evening fire, the ukulele tormentors, the beach party, the bathing suit romp, the tennis or golf game. Our vacation pictures are informal, human,



IRISH THATCHED COTTAGE.

Josephine M. Wallace.

unposed, vital and alive with interest. True, many of them are sadly lacking in art quality as judged by the standards of the hanging committee in the exhibition. But they should not be so judged, because not made for that purpose, or to meet the serious competition of those who use camera in place of brush.

The pocket Kodak is a servant; the old camera was a master, aye, a task master. The roll of film and the tank have taken the drudgery out of photography. They have left it all its interest, all its spontaneity, all its intriguing pleasures, while laying away for good not only muscular effort, but mental bother with matters of physics and chemistry.

But they have not in the least removed a single one of the art possibilities of the photograph from within our reach; rather have they added to them by such means as orthochromatism, lack of halation, speed and simplicity.

Therefore, I, who can look back upon a more or less honorable length of service to the goddess of red light and sensitive emulsion, feel that some one should sing the real praises of the modern improvements of the art, and emphasize not so much the ease of body, and the lack of muscle strain of a roll of film and a pocket Kodak, as their striking from the mind, the shackles of difficulty, trouble, failure and sluggishness of working, which were concomitant with slow dry plates, heavy instruments, sunlight printing and heavy and sluggish lenses, all expensive and none efficient in any but highly skilled hands.



Figure 1.
Baby Pelicans.



Figure 2.
Black Skimmers Over Nesting
Ground.

THE VEST-POCKET CAMERA IN WILD LIFE PHOTOGRAPHY

By STANLEY CLISBY ARTHUR



IN the realm of nature photography, a kingdom of pleasure and interest where one can imagine only the reflex and the long focus lens being useful, there is a special place for the miniature of the camera family—the modern and commonly-called, vest-pocket picture taking machine.

In spite of the size of the picture it makes this erroneously styled “vest-pocket” (as a matter of fact most of us do not wear vests, especially in summer, which is picture taking time, and, besides, these species of cameras wouldn’t fit a vest pocket if we did wear ’em) camera can and does make useful and valuable nature pictures.

I have in my collection of several thousand negatives of birds and mammals several hundreds of prized exposures on roll film that were made with an Icarette A fitted with a compound shutter and a Beck Mutar lens working at F.4/9, of 3-inch focus, that takes a $2\frac{1}{4} \times 2\frac{1}{4}$ inch image.

I have used this camera from Louisiana to Labrador for making plain record pictures, long distant “shots” and “close-



1. Baby Terns Taking to Water.
 2. Wapite or Elk Photographed from Horseback.
 3. Brown Pelicans in Flight Over Nest.
 4. Black-crowned Night Herons.
 5. Nest and Eggs of Night Heron.
 6. Wapite or Elk Stalked and Photographed from Horseback.
- Illustrating article "The Vest-Pocket in Wild Life Photography,"
by Stanley Clisby Arthur*

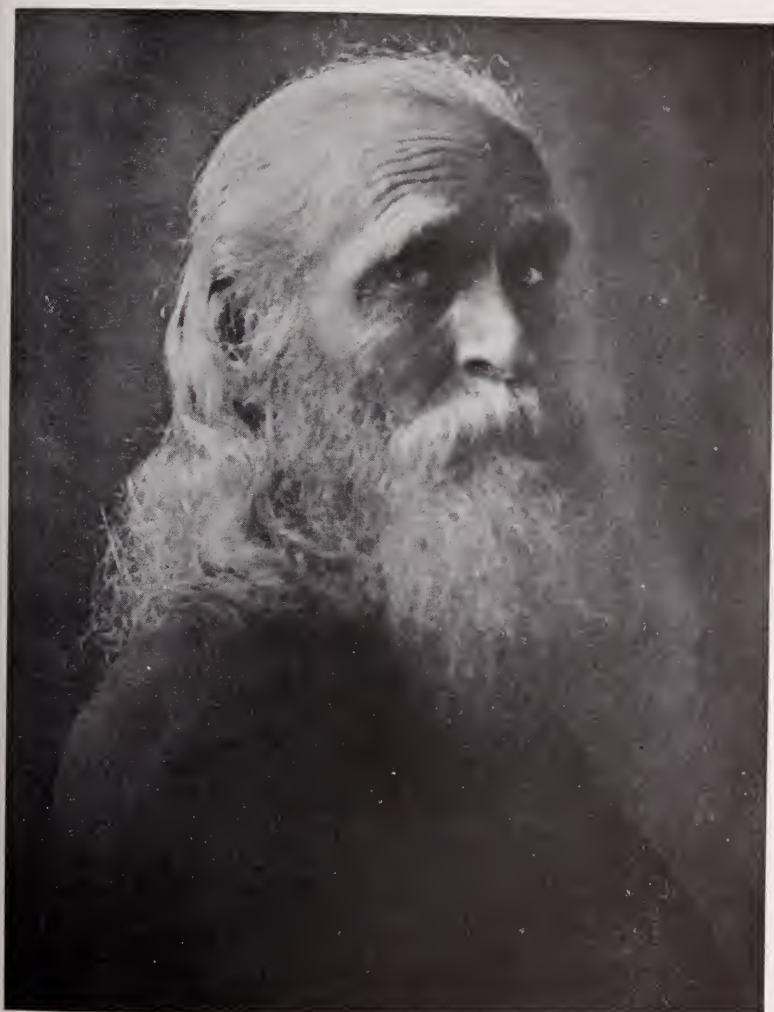
ups." I have "stopped" black skimmers on the wing, pictures that show something more than infinitesimal specks against a sky; baby birds on their nests, ducks in the water and in the air, elk wandering through the thick underbrush of their habitat, wary denizens of the wild that had to be stalked on horseback into camera range. High on a tree top I have set this baby of the camera world on a kodapod, focused it on a nest and, from the ground, by the pull of a thread, pictured rare domestic bird scenes that could be secured in no other fashion.

If the proof of a pudding is in its eating, proof of a wild life camera is in the resultant prints or enlargements you show your friends. Wherefore, I offer, as evidence of what a miniature camera is capable of doing in the realm of wild life photography, the accompanying contact prints. To really appreciate what a camera of this size can do enlargements to 5×7 or 8×10 should be inspected, and, for that matter, I have some exceptionally fine bromides measuring 11×14 that were taken from a portion of the $2\frac{1}{4} \times 2\frac{1}{4}$ negatives.

As to the merits of the different members of the small camera family I find, after experimenting with them all from the $1\frac{5}{8} \times 2\frac{1}{2}$ to the $3\frac{1}{4} \times 4\frac{1}{4}$ size, that the most useful and all around valuable miniature camera is one of the $2\frac{1}{4} \times 3\frac{3}{4}$ variety, equipped with a good anastigmat (F.4/5 is not an absolute necessity, although it is a dandy reserve force to always have at hand). A shutter capable of 1-300th down to 1 second, a kodapod or an octipod, a self-tripper, self-timer, time-valve (call it what you will) and a spool of tough black thread should be included with all outfits.

With such an equipment you can do a lot. True, the short 3- to 4-inch focus of the lens will not get you large images of birds, or other objects, at a distance, but they will get you images nearly the size of the film used if you entice your subjects into proper range.

Two of the finest bluebird photographs I have ever seen were taken by a lad in the Louisiana pine woods with a $2\frac{1}{4} \times 3\frac{3}{4}$ vest pocket Kodak. He discovered the nest where the parent birds were rearing a mighty hungry family. He tried stalking, creeping up on the nesting site so as to snapshot the devoted two bringing countless worms for four ever-open throats. He got nothing after three whole days of hard work.



THE PATRIARCH.

DR. C. F. RODGERS.

Then he took a tip from an experienced hand at the game. He drove a stake into the ground within less than three feet of the nesting stump the bluebirds called home, attached the Kodak to the stake and focused carefully on the top of the stump. To the compound shutter he attached a thread and hid behind a bush 25 feet away.

He pulled on his thread six times in less than twenty minutes and when he rolled up the film he knew he had six perfect pictures of parent birds bringing food to the voracious family hidden deep in the stump. When he developed the film he proved that his guess of six perfect bird portraits out of six yanks on the thread was correct.

Intelligent use, and a complete realization of the size of the image being secured, will work wonders getting the right pictures with the vest-pocket camera. This camera is now occupying the place predicted for it just a few years ago. The cost of a suitable lens working at a large aperture is now not out of reason, or the reach of the pocket. There is a saving in weight, size and the cost of negative material, and an added convenience in having a camera with you all of the time. In the open I am never without mine, carrying it in a holster attached to my belt in which is carried, beside the camera, six rolls of film, a self tripper, a kodapod and a spool of thread.

Depth of focus is an added value to the small camera. It bears a most important relationship to the focal length of the lens. The diameter of the circle of diffusion at any point in the image is directly proportionate to the square of the focal length. The blur resulting from the use of a lens of 7-inch focus at any given aperture will be four times the diameter and sixteen times the area of that given by a lens of $3\frac{1}{2}$ -inch focus at the same effective aperture (or the same relative F. value), and for very near objects the difference will be greater.

Therefore, by the use of the short-focus lenses supplied with the modern vest-pocket cameras ($3\frac{1}{2}$ -inch lens being found on practically all the $2\frac{1}{4} \times 3\frac{1}{4}$ cameras) we increase to a most remarkable extent our power of securing, and with comparatively large apertures, negatives in which the images of *all* objects, whether near or far, are rendered in sharp focus.

If a print from the smaller negative is enlarged to the same



THE CLOUD.

EDGAR N. POOLE.

size as a picture secured from the lens of 7-inch focus, or if enlargements are made from both negatives so that the resultant pictures are of exactly the same linear dimensions, the bromide from the vest-pocket negative will be markedly superior to the enlargement from the larger negative, especially in regard to the unpleasant blur in the foreground or background objects that were not rendered sharp.

But the vest-pocket camera, exceptional piece of modern mechanism as it is, cannot perform miracles. The silver grain of the photographic emulsions now supplied us prevents this.



Figure 3.
Cabot Terns in Flight.



Figure 4.
Brown Pelicans Nesting Colony on
Mudlumps, Mouth of Mississippi
River.

It will be found that when you have secured a negative of a large negative, that is, an object that is large in proportion to the area of your film, it will enlarge to almost gigantic proportions, whereas a negative that may be "sharp as a needle," but which contains a multitude of small objects, will prove a miserable failure when "blown up."

In the accompanying examples of what an Icarette will do in the wild life field, the close-up of the baby pelicans on their nest (Figure 1) will make a satisfactory enlargement, while an enlargement from that of the black skimmers (Figure 2), or the flying Cabot terns (Figure 3), or of the pelicans on the mudlumps (Figure 4), will be blurry and grainy. Some day, when the film manufacturers give us the prophesied "grainless" emulsion, then will the miniature camera make "miracle" pictures.



CURLY LOCKS.

Merle Boyer Studio.

In the small camera there is the advantage of exposure to be considered. The short-focus lens will allow us to stop motion with a 1-300th, or even a 1-200th, that will "freeze" moving objects that call for the 1-1000th of our focal plane shutter on our 4 x 5 Graflex. This shortening of exposure allows us, who use the vest-pocket camera, to shoot pictures at F/11 and secure full exposure and an added definition at the same time, something that is not possible with the longer focused lenses.

In use I practice making pictures with a small camera at F/11 with a shutter set at a 1-25th exposure, and the result is a series of uniform negatives. Should there be movement of the object being photographed I use 1-50th or 1-100th, opening up slightly to compensate for the extra speed. Should it be the photographing of something in flight the lens is used at full aperture of F.4/9, and the shutter set at the 1-300th maximum.

While not successfully competing in every way with the Graflex, and the long focus lenses of the wild life photographer's outfit in *all* things, the vest-pocket camera has its place in the ever growing field of nature photography, and should be a part of every cameraman's equipment when he hies himself to Nature, and endeavors to record her many creatures.



B. F. LANGLAND.



Figure 1.
SKULL OF AMERICAN ANTELOPE.
Illustrating article "Photographic Selections for 1923," by Dr. R. W. Shufeldt.

PHOTOGRAPHIC SELECTIONS FOR 1923

By DR. R. W. SHUFELDT

DURING the past year my work in photography has been of an unusually varied character, and of subjects illustrating many departments and fields in which the camera comes into play. Upwards of an hundred of my pictures have been published by the American Forestry Association in its elegant publication *American Forestry*. Most of these illustrations are of a class that appeal, in one way or another, to our foresters, to naturalists, and to students of nature in the open.

Having published hundreds of osteological plates and secur-



Figure 2.

A STATELY WHITE HOLLYHOCK.

Illustrating article "Photographic Selections for 1923," by Dr. R. W. Shufeldt.



Figure 3.

MAGNOLIA BUDS.

ing the illustrations by cameras of various sizes, a few words on the matter of backgrounds may come in here. As a rule, if properly prepared, the skulls and other bones to be figured are nearly pure white; but this is not always the case, for they may be from a very pale to a rather deep ochre. Many years ago I photographed a long series of bones of fossil birds, and the specimens were a dull black—in a few instances a shiny black, with a few an earth brown. So much, then, for the colors of the objects we have to deal with; but they will



A STUDY IN BLACK AND WHITE.

DR. R. W. SHUFELDT.

have everything to do with our decisions in the matter of backgrounds to be selected. Next comes the question of lighting, and here we must consider its direction and source. It may be sunlight of varying intensity coming from overhead; from a window on one side or on both sides, and so on. Then a powerful electric light may be used as coming from any angle; but personally I have not obtained, with this class of subjects, as satisfactory results as where sunlight has been employed as the illuminating medium. Whichever is used, however, one should invariably secure full lighting values, and get rid of shadows and brilliant areas on the background by the use of a reflector. For this purpose I employ a thick piece of pure white cardboard, about two feet by fifteen inches. This is held vertical to the rays of light lighting the specimens, and turned about until the light reflected from it and thrown upon the specimens produces the maximum amount of illumination, to the point of killing all shadows possible and minimizing the high lights. When all arrangements are satisfactory, the bulb to your shutter may be pressed with your unemployed hand and the exposure duly made.

Bones having various shades of color, all the way to include black, will give no special trouble when all the factors entering into the operation have been scientifically handled; but the case is quite different with chalk-white bones, and the point to be considered is whether pure white backgrounds or dead black ones are the best to bring out all the details of the specimen or specimens being photographed. This is a subject I have discussed with many authors who illustrate their writings as I do with plates, the figures on which are reproductions of various subjects obtained by means of photography, and I find not a few opinions entertained in the premises. Should a pure white background be employed and the side-illumination not skillfully handled, more or fewer of the shadows of the white bones being photographed will, on the background, run in with the shadows caused by the elevations and depressions on the bone itself, thus killing the true outline of the subject. Through careful observation, this very serious defect can be wholly obviated, and in the result any particular white bone may be made to stand out in such a manner as to have the appearance of the original placed on a sheet of white paper.



Figure 4.
PASTURE THISTLE AS IT GROWS.
Illustrating article "Photographic Selections for 1923," by Dr. R. W. Shufeldt.

With entirely black backgrounds the difficulty becomes greater ; and so, as a rule, the white ones are to be preferred.

It is well to know that certain shades of orange (very pale), or tan, or pink, in the case of photographing pure white objects to be reproduced as plates, often give fine results under proper precautions ; but space will not admit of my further discussing this important point in this place, especially as I may take it up in another connection. A properly photographed skull is here shown in Figure 1 ; it is from the almost extinct American antelope, and I made the picture from a United States National Museum Specimen.

Often our best known and most abundant garden flowers are fine subjects for photography, and one I secured of a common hollyhock, reproduced in Figure 2, forms a good example in illustration of this. There is not a little in this picture for young botanists to study, as considerable detail of flowers, buds, seed-pods, and leaves are in evidence.

An example of a single subject showing the complete lighting in the case of a flower is well shown in Figure 3 which presents a reproduction of one of my photographs of magnolia buds. The color here was cream white slightly shaded with a reddish-purple, and the uniform lighting was secured by the use of the cardboard reflector described in a former paragraph.

Some of the most attractive flower pictures I have taken have been those secured in nature—just as they grow, and an excellent example of these is the old Pasture Thistle here reproduced in Figure 4. The scene was in an abandoned and overgrown field lying between two copses of mixed trees of no great height. Other thistle-plants are seen growing in various places, while many milkweed butterflies are lazily and in hesitating flight passing from one flower to another. Two of them are enjoying themselves on the plant in the foreground, and the one seen on side view is readily recognizable. This picture was secured with my Voigtlander lens, and an instantaneous exposure with an extremely small stop. Time : midsummer on a very clear day.



THROUGH THE ARCH, WASHINGTON SQUARE. G. W. HARTING.

PHOTOGRAPHY OF THE STAGE

By FREDERIC FELIX

N the late 80's—or thirty years or more ago—the newspapers and periodicals did not receive market basket donations of theatrical photographs, as is customary in these days. At present, nearly every publication has almost to run away from the profusion of photography offered in the managerial hope that some of the players' likenesses, or the stage views may be used, thus to extend the publicity work so valuable in making Broadway offerings the successes desired at the hands of the public. In the old days of a generation or so ago, the publication enterprising enough to wish to include stage pictures had to send an artist to make a sketch of the scene. Stage photography had not begun to make itself effective, and there was a great distance between the line drawings of those times and the present perfection of reproduction both as it is carried out in photography and in printing in the publications.

It is interesting to note that the pioneer of present day stage photography remains active in a New York studio, and that, while not devoting most of his time to the stage, as he did years ago, he still goes out occasionally to make a few views in the theatre for some special friend or old time patron. The gentleman is Joseph Byron, and he is the recognized patriarch of stage photography. He came to New York thirty-three years ago from Nottingham, England. In his native town he followed the photographic footsteps of his father and grandfather, the studio activity of the family extending back to 1851. In New York Mr. Byron is giving way to his son, thus extending the work into a fourth generation.

Mr. Byron made a photograph March 10th, 1863, in Nottingham, that was the forerunner of all present day flashlight work. It was during the progress of a bullock roast, celebrating the wedding of the Prince of Wales, who became King Edward. He used magnesium ribbon or wire and, when ready for his exposure, threw a quantity of it into the barbecue fire,



HENRY IRVING PLAYING DANTE.

Illustrating article "Photography of the Stage," by Frederic Felix.

producing a great flash that startled the assemblage and made everybody talk of the affair. He was sixteen years of age at the time and quite an experimenter. His grandfather approved the idea, and offered to finance him in any further experiments he would wish to make. He promptly availed himself of the encouragement and was able, in succeeding years, to move flashlight work along rapidly, and also to keep his particular part of it well individualized.

Before leaving England Mr. Byron used flash powder successfully in a number of stage exposures, but he did not attempt to specialize in the work. Soon after coming to this country, however, he took it up actively and for fifteen years or more was practically the only operator depended on for such reproductions. Nothing of the kind was being done in this country before his arrival.

From the earliest attempts, through all his successful years, Mr. Byron has used only pure magnesium. He made scores of attempts to vary the composition, to no advantage.

Among his first photographs in this country of the stage set with scenery and filled with players, were those he made of "Blue Jeans," about 1889, under arrangement with Daniel Frohman. The work was so successful that it was given instant recognition and patronage. Mr. Frohman found it especially valuable in the booking of attractions, as the photographs told a full story to a manager in a distant city that was never previously so effective with sketches.

In the early days an 8 x 10 outfit was used, with a lamp burning alcohol, through which the magnesium powder was forced by means of a blow pipe tube, taken in the mouth. The lens was a twelve inch Dallmeyer rectilinear, and Howard plates were used.

In the early days the newspapers and other publications that were using photographs of the stage to supplant the sketches that had been the rule before, were buying the pictures of Mr. Byron. Then there came an awakening on the part of the publishers, who, recognizing the value of their advertising, declined to make any further purchases. They waited for the theatrical managers to start the practice that is now universal, of providing the stage photographs as free offerings. Mr. Byron found his business practically in a state of collapse at



KATHERINE REVNER AS PRINCESS ELIZABETH
IN "PRINCE AND THE PAUPER."

Illustrating article "Photography of the Stage," By Frederic Felix.

this turn, but he met the situation by bringing the managers to a speedier realization of what their best interests were. George Lederer and his partner, of the Casino, were the first to accept the new arrangement and to give their orders direct to Mr. Byron, and to deliver the pictures he produced free to the publications that had previously been paying to have them made.

Mr. Byron has made a wonderfully successful succession of flashlight photographs of the stage set for action, with entire absence of improper shadows, with full modeling of the players' features, and with a general lighting effect far outrivalling any possibilities of daylight. For years past a 11 x 14 camera has been used, with a fourteen-inch Ross-Goerz lens and Wratten panchromatic plates. The pure magnesium is burned in lamps of Mr. Byron's own designing, never put on the market. Bags are never used, but the amount of smoke produced is negligible. In one night, in Milwaukee, he made seventy-six successive photographs with flashlight, a good proof that smoke can be kept down to a decided minimum. One manner of avoiding smoke is the use of powder in small quantity. The great fault, Mr. Byron contends, is in using an excess of powder and ninety-nine per cent of flashlight pictures are faulty because of that reason instead of a lack of powder. One of the secrets of successful illumination is in placing the lights properly and intelligently. In Mr. Byron's plan he uses from three to seven operators with lamps. He has a method of synchronizing their several flashes. The lamps are scattered around the front of the stage and back of the scenery in such manner that every lighting effect that can be wished for is realized.

To avoid the undesirability of having the players show by their eyes that a flashlight photograph is being made, Mr. Byron has followed the plan of making a short, preparatory flash. The lens is then immediately opened, with the larger flashes occurring in the same instant, the result being that the eyes are then caught in a normal condition as being accustomed to what is going on by reason of the small flash.

All the monumental figures of the stage—Jefferson, Bernhardt, Mansfield, Irving and so on—are included in Mr. Byron's negative list, as well as all the present day stars from

their earliest days on the stage down to the time of his retirement from his old-day activity. In arranging for the first flashlight photograph of Mme Bernhardt, she consented only with the understanding that fifteen minutes would be used. When seven or eight exposures had been made she disregarded the unelapsed time and walked off the stage, evidently distrusting the entire innovation as a humbug. But, the next day when several of the newspapers reproduced the pictures that had been made she realized the importance of the new plan and sent for Mr. Byron. She arranged for every costume and every scene of her tour to be taken, and further had all kinds of pictures made as she was moving about naturally in her rooms, with her friends at hand.

An achievement out of the ordinary was recently effected by Mr. Carl W. Atkinson. He was able to get fine pictures of the regular public presentation of "The Trial of Joan of Arc," by Margaret Anglin and company, at the Shubert theater by illumination from the regular theater lighting, and from a place among the regular seats of the house. Several successful pictures were made in this manner. An ordinary camera was used, $6\frac{1}{2} \times 8\frac{1}{2}$ in size, with 5×7 Barnet superspeed orthochromatic plates. The lens was an F/3 Aldis, ten inch focal length, and the exposures were from one to two seconds. Forced tank development, with double strength solution and double time, was used, because the lighting did not have the contrast that it might seem.

New York is filled with photographers who include stage work in their specialties. The product of a dozen of the leading houses is marvellously effective and beautiful, so much so that each studio could easily supply material for a separate additional article.

AMBITION versus EGOTISM

By SIGISMUND BLUMANN



MULATION leads to greater effort, better work: jealousy creates a desire for more approbation, distinction, prominence. One seeks to do as well or better than a standard, the other merely desires to stand out by any means or method.

And we have the "Climber" in photography as we have him in society. I speak of him who clings to the skirts of the great, flatters, plots, and imitates till he shall have found a foot-hold and is rooted, whereupon he too often wields power and uses it for much evil.

You may know him by the fact that he is always an enthusiastic admirer of present company, but an insidious knocker of absent co-workers. His praise is a bid for place for himself. It is currency for exchange. He seeks to rise less through his own ability than by your influence. When you cease to be useful you cease to be praiseworthy. He never condemns openly but damns with faint praise. You cannot corner him, for he keeps a hole behind him into which to retreat.

Not a lovable character. Have you such a little fairy in your club? Be sure it is not yourself then Scotch him. When you have helped to make him innocuous the atmosphere shall be sweeter.

In picture making, whether by hand and brush or the camera, egotism hinders great achievement since the consciousness of self detracts from whole-hearted concentration on the mood of the thing. You cannot see the landscape in the mirror if you stick your own face close to it, and focus your eyes on your own image. You cannot produce to please the gods when your fixed purpose is to please certain men who are expected to give you a sort of fame. In a word, you should make pictures, not coin a price for popularity.

Value not Salon honors too highly. What one jury honors another rejects. Nor console yourself with this fact. The



AN ALGERIAN PASTORAL.

Louis J. Steele.

condemnation is probably the better judgment. But study much, learn what you can, strive for excellence and make pictures that depend on no jury, no influence, no formulated novelty (the paradox is purposeful and intentional) for your place. Satisfy your own innermost conscience after you have refined and cultivated that conscience.

Many a man knows within himself that his work is rotten the while he gets highly enraged at someone's telling him it is so. He seeks to fool a cold blooded world who doesn't particularly love him when he cannot fool himself, the object of his greatest affection. Be you not one of these.

When, after slow and arduous climbing you have reached the heights, you will find yourself very little inclined to rail at critics and criticism. Secure in your place you will learn from the mouths of all men and babes and be willing to hear and you will be grateful. For criticism is not so malicious as false praise.

The man who slobbers flattery over me is the man whom I fear. He is most likely to slander me in my absence. The flatterer is ever morally weak, and the courage that fortifies a frank critic is very apt to carry with it rightness.

Shortly after having served on a Salon jury, I wrote an article on Criticism and it came to my ears that this was considered a defense of myself. Dear souls, not a defense at all but consolation to the judged. It did not seek to defend but to solve. As a judge my worth is open to question and debate. Some esteem me highly, some hold me in extreme contempt. Let us take a canvass and find how many love me whom I have felt compelled to keep off the walls, and how many detest me whom my judgment has seen fit to praise.

And how little my opinion matters to the really great! They do not make pictures for me to praise but to enrich an art to which they are devoted. They do not know me. Their excellence and their standing does not depend on my opinion, good or bad. They are not what the opinion of men makes them seem, they are what they are because they are.

Sic semper idem.

THE VIEW CAMERA FOR THE AMATEUR

By JAMES G. TANNAHILL



ANY amateurs, after acquiring experience and knowledge with a Vest Pocket Kodak or a Box Brownie, are desirous of advancing in photography, but are at a loss to know the proper equipment necessary in order to obtain the best results.

The plate camera, with ground glass, naturally suggests itself as the most practical, but since there are many different makes and types on the market at the present time, it may prove difficult for the beginner to make a proper selection.

It is here that the view camera commends itself to the serious and practical worker, and this article is written with the hope that it may prove of assistance to those amateurs who wish to take up photography in its more advanced stages.

Until recently the view camera was considered by many amateurs as belonging strictly to the professional, but during the past few years many advanced workers have adopted the view camera as regular equipment to their outfit, and the results have been surprisingly good.

The chief objection, however, to the view camera is its weight, but this objection may be overcome to a great extent, as will be explained later on in this article.

So far as the writer has been able to discover, the smallest view camera is the 4 x 5 size. This size camera offers practically the same advantages as those of the larger sizes, and is the choice of many owing to its compact size.

The 5 x 7 view camera is used by many amateurs, and one point in its favor is that smaller sized negatives, such as 4 x 5, may be obtained by the use of kits. These kits are small frames, made of very light wood and are placed in the regular plate, or cut film holders, after which the plates are inserted therein and held securely by two small clasps.

The advantage of the 5 x 7 size is that smaller sized negatives may be made with the large size view, but 5 x 7 negatives cannot be had from the 4 x 5 camera. Should cost enter the



THE VEILED LADY.

LOUIS J. STEELE.

case, as is likely in experimenting, it is advisable to use the kits with the smaller sized plates.

A few of the principal features to be considered in a good view camera are the vertical and horizontal swing backs; the reversible back; rack and pinion; rising and falling front; lens board and back extension. A brief description of each follows.

The use of the swing back is to keep the plate perpendicular with the object being photographed. Thus, in photographing a very tall building, where it is necessary to tilt the camera in order to obtain the full size image, it will be found that lines of distortion appear and the building will converge at the top. To overcome this difficulty, the swing back is brought into use and by its use, the building will appear as the eye really sees it.

The advantage of the reversible back is apparent when it is realized that to change the position of the camera when either vertical or horizontal views are desired, would involve much trouble; by simply changing the reversible back the desired position may be had.

The rack and pinion device consists of a milled runway over which a milled roller operates, and by racking the bellows back and forth the proper focus may be obtained with slight effort.

The rising and falling front will prove valuable in picturing buildings or landscapes where objectionable foreground may appear. By raising the front less foreground will appear in the picture.

The convenience of the lens board is much appreciated by workers who have use for different lenses. While some of the ordinary plate cameras have removable lens boards, not all are equipped with this convenience. By its use, different lenses may be used by simply screwing the lens into the flange which is screwed to the board itself.

Special attention is called to the back extension of the modern view camera.

Its use is indispensable in using the convertible features of lenses. Where wide angle lenses are employed the bellows can be racked back and the front extension closed, thereby obtaining a wider view. By the use of the convertible features of the lenses, different sized objects may be obtained. This point is illustrated in a later paragraph.



MOSKORINA. PREMIER BALLET.

P. J. SCHWEICHART.

While the main point of this article is to call attention of the many advantages of the view camera over the ordinary



Figure 1.

plate camera, it may prove of assistance to many amateurs to consider in brief the subject of lenses adapted for use with the view camera.



Figure 2.

The two types of lenses most commonly used with the view camera are the rapid rectilinear and the anastigmat. Portrait,

wide angle, long and short focus and diffused lens may be classed as above.

While the rapid rectilinear lens has its field and will in many cases give very good results, the use of the anastigmat is advised. Since many workers prefer the anastigmat, this article will deal only with that type of lens. For all around work, field, commercial, portrait, copying, enlarging, reducing the anastigmat lens will give very good results.



Figure 3.

The bellows extension is still another feature which should be given serious consideration. In the ordinary plate cameras 12 to 15 inches is about the general run, but in view cameras a draw of about 20 inches in the 4 x 5 size, and from 22 to 26 inches in the 5 x 7 size is advised. This is an essential point and should not be overlooked, for in using the single elements of the convertible lens it will prove indispensable. Triple extension rather than double extension of the bellows should be a point in selecting the view camera.

To those unacquainted with the different types of lenses a brief description is here offered.

Anastigmat lenses can be divided into three classes and,

the selection is therefore left to the reader, as to which lens may best be suited to the particular needs of the individual.

The true convertible lens is formed of two fully corrected combinations of unequal focal length, and each may be used alone.

The symmetrical lens is composed of lenses having equal focal lengths and are also corrected for use as single lenses. However, using the single lens alone will double the size of the image, whereas in the true convertible lens, three different sizes may be obtained.

The third and last type of the anastigmat is that lens which can be used only for the plate for which it is listed, and its use for the view camera is not recommended by the writer.

After many different cameras had been tried by the writer, the one selected was the 5 x 7 View with convertible anastigmat lens working at F6/8, and having a focal length of 8½ inches. This is a true convertible, the rear lens working at F12/5, and having a focal length of 14 inches, while the front element working at F/16 has a focal length of 20 inches. This outfit the writer has used for many years, and is one which will do whatever called upon.

The use of the back extension, reference to which was made in a previous paragraph will here be illustrated in conjunction with the use of the different focal length of the lenses.

In Figure 1, the doublet or complete lens was used. The camera was approximately one third of a mile away from the object being photographed.

By removing the front lens and using the rear element alone, the picture as shown in Figure 2 was obtained, while in the case of Figure 3, the front lens was replaced, and the rear lens removed. As will readily be seen three different sized pictures were obtained, and all were made with the true convertible lens.

This same effect, however, could have been obtained by using what is known as a telephoto lens or attachment, but as this type of lens can be used for magnifying or enlarging only, its use is not advised for the amateur whose pocketbook may not stand such a strain.

In a previous paragraph reference was made to the weight of the view camera as being the chief objection. While this



THE TAMBOURINE DANCE.

Herbert Irons.

objection, to a certain extent may be sustained, the writer believes it may be overcome to some degree.

It is admitted that to take a "hike" in the country with the regular outfit of the view would entail considerable trouble, but the writer is using the view camera very much for outside work and has adopted an outfit which has proven very satisfactory.

A French knapsack, such as was used in the late war, is what is used by the writer. It is made of strong canvas on the upper part, while the lower half is made of leather. Several compartments will adapt themselves to taking as many as eight plate or film holders, back extension, tripod and top. The tripod, however, may be carried in the hand, or left in the knapsack, protruding slightly beyond the edge of the bag. With the introduction of cut films, however, much weight has been eliminated.

The knapsack can be slung over the shoulder and carried conveniently on the back or side. With this style equipment, the writer has "hiked" many miles in the open country and it may be said, without fatigue. The results from a trip such as this have been negatives impossible to obtain with the ordinary type of plate camera, a sound body and a healthy appetite.

The use of a view camera with a good lens is recommended to those who are serious for better pictures, and its use cannot be too strongly urged.

To those amateurs wanting to learn more, the writer would add that the camera clubs offer ideal inducements, and with proper concentration on the work, it will be but a short time before the amateur will have mastered photography in its advanced stages.

SEPIAS WITH CERTAINTY

By AUGUST KRUG



O claim is made that all of the methods I am about to advocate are either new or original: they are simply so little known that some space in the *Annual* may with profit be devoted to them.

The prime requirement in securing good sepia tones on either bromide or developing-out papers is full development of the black-and-white print. Every particle of the silver halide which has been acted on by light must be reduced to the metallic form. An acceptable sepia color will always result if the original print has been correctly exposed and developed as far as it will go, even to the point of inducing a trifle of chemical fog.

The hypo-alum process will yield sepias of excellent tone, with a fair degree of uniformity. The reaction, however, is somewhat involved, and the results, in my hands at least, are not altogether permanent. It may not be quite fair to blame the mottled sepias in my possession on this process, since other causes may have induced their fading: nevertheless, he who pins his faith to the bleach-and-redevelopment method of obtaining sepia tones will not have cause to complain of fugitive prints. If he should happen to fail, he knows it at once.

The procedure is well-known, of course. The black-and-white print is bleached to convert the silver image to one of the halide salts, which is then in turn changed to silver sulphide, normally a dark-brown, stable compound. Proportions differ: a good formula for the customary ferricyanide-bromide bleach follows:

Water	30 oz.
Potassium ferricyanide	1 oz.
Potassium bromide	1 oz.
Denatured alcohol	2 oz.

In using this bleach it is imperative that the prints be free from all traces of hypo, if details in the high lights are wanted. Otherwise the hypo in the print will combine with



SEA URCHINS.

G. H. S. HARDING.

the ferricyanide in the bleach to form Farmer's Reducer, which will slightly reduce the print all over, but mainly in the lights, where, too, it will be most apparent. The ferricyanide bleach is also productive of blue spots, caused by iron in the paper, or in the water used for making up solutions, washing, etc. The reaction between the iron and the ferricyanide forms prussian blue. In severe cases the blue coloration extends over the whole print.

It is ordinarily advised to touch the spots with strong hydrochloric acid to get rid of them: if this fails, a weak solution of sodium bicarbonate (baking soda) will sometimes loosen them up. To prevent the blue spots avoid using chipped or cracked enameled trays which have the iron base exposed. Filter the water you are using through several plies of cheese-cloth or muslin. Better still, try one of the other bleachers now available. Any bleacher advocated for bromoil work is good. Some recommend the permanganate bleach highly. Or try the following:

Water	32 oz.
Copper sulphate	1/4 oz.
Sodium chloride (common salt)	1/2 oz.

Do not bleach or wash the prints by strong daylight. Wash thoroughly to free the prints from bleacher: it is not necessary to dry after bleaching.

It is customarily recommended that either the sodium or barium salt be used to sulphide the bleached image. They are both open to objection, the sodium sulphide being unstable and likely to contain impurities, the barium sulphide being difficult to dissolve and giving tones tending to yellow.

Altogether, the best redeveloper available is ammonium sulphide solution, obtainable at any large chemical supply house in pound bottles. This is a clear yellow liquid, quite stable, easy to use, and most efficient. A single sniff at an uncorked bottle of it will serve to convince the most skeptical of its efficiency.

For use, a few drops of the solution are added to a pint of water, and well stirred, when a milky emulsion will be formed. The exact proportions are immaterial: unless you own and use a gas-mask, you will do well to add no more of the ammonium sulphide solution than is actually required to do the work. This solution exercises a softening action on



FIGURE STUDY.

JOHN HOWARD PAINE.

the gelatine film as do all sulphiding baths. With certain bromide papers this results in severe blistering, which is undesirable at the least and extremely irritating at most. A hardener, such as alum or formaldehyde, is stirred into the sulphiding bath to enable the gelatine to overcome the blistering tendency. Its use is recommended anyway. A good formula, then, for the sulphiding bath would be about as follows, although as before stated the proportions need not be strictly adhered to:

Water	32 oz.
White (or potash) alum	1 oz.
Ammonium sulphide solution	60 min.

A clean, unchipped enamel tray is best for the sulphiding process. The action begins immediately, but the prints should be left in the solution until the image has had time to become completely converted. If all the operations are properly carried out, the prints will assume a rich brown color, free from any tinge of yellow or purple. They should be washed thoroughly, dried in the usual manner, and mounted either wet or dry at the option of the photographer if the hardener is used in the redeveloper.

The making of sepia prints by this method will never become a very popular indoor sport, since the suspicion of his having been in close communion with an egg of the throwing variety will have the net result of bringing the photographer in bad odor with other and probably more influential members of his family. If, however, we inconvenience ourselves and others, olfactorily speaking, we should see to it that we are reimbursed to a certain extent by the acquisition of sepia prints which are beautiful in color and unquestionably permanent.



SPRING.

TAIZO KATO.

PHOTOGRAPHY IN MEDICAL WORK

By MILES J. BREUER, M.A., M.D., F.A.C.P.



THE camera has played a very important part in the advance and dissemination of medical knowledge. We are, however, accustomed to considering that its usefulness is limited to research and the big institution, and quite out of the sphere of the average practitioner. Yet, it is in the hands of the latter that photography can find one of its greatest opportunities for usefulness. The physician whose daily task lies among the masses of ordinary folks, and who is not backed by an elaborately equipped institution, can increase his own efficiency, his contribution to the progress of his science, and his satisfaction in his work, by the intelligent use of the camera.

I am indicating below some of the main uses to which a camera may be put, in the work of a general practitioner, but my discussion is by no means exhaustive. It only hits the high spots, and the man who becomes at all interested, will find that he can branch out from these main lines and make the camera help him in many other ways.

RECORDS

By the kind of records a doctor keeps, you can tell how good a doctor he is. The efficiency of his services to his patients, and his value to his profession, depend directly and primarily on his records. The day is past when a medical man can depend on his head to hold all he needs. And to-day, what records is it possible to keep, without photography? Only financial ones. In all other kinds of records, photography fills a place which cannot be filled by any other method.

(a). Routine Records.

Often the picture of a lesion, deformity, or other condition, can be made so much more quickly, and will describe and record the condition so much more clearly and accurately than a verbal description, that the latter is a waste of time and effort. Again, there are conditions that can scarcely be de-



IRVING S. LOVEGROVE.

scribed in words at all, while a picture, made in a moment, will give all the desired information. Pictures also yield up their information more quickly, when the records are later referred to; accurate descriptions of unfamiliar or abstract things make difficult reading. In Figure 1, which was made to illustrate a discussion on thoracic disease, the appearance about the neck and shoulders, the various muscle spasms and atonies, are very difficult to convey in words in such a way that the hearer will recognize the same things when he sees them in another patient. From a picture, he can recognize the condition at once, the next time he sees it.

(b). *Protection of the Physician's Interests.*

It is astonishing how people forget how serious their trouble



Figure 1.
Physical Signs of Thoracic Lesions.

was, after they have gotten well, and the time has come to pay the bill. Patients will criticize a surgical result because they have forgotten what they had to start with. In the case of the patient shown in Figure 2, the leg was straightened perfectly, but remained about three inches short; the picture reminds us that we did pretty well, considering. A glimpse of a picture of the original condition, and a comparison with the result after treatment, will remind folks what the doctor has done for them, and increase their gratitude, both sentimental and material.

(c). *Medicolegal.*

No matter how well qualified a doctor is, or thinks he is,

he must always consider the possibility of malpractice suits. Sometimes they drop out of a clear sky. If, in such a case he can show a picture of the condition as it existed when the patient came to him, he stands a much better chance with a judge and jury. If in addition he can prove that it is his



Figure 2.
A Difficult Problem for the Surgeon.

custom to make such pictures as a routine, his chances are still further increased.

(d). *Curiosities.*

All of us like to keep a collection of the rare and curious things that come up in our work. This is especially interesting in medical work, apart from its scientific value. However, many of the rarities and curiosities that the doctor sees, are incapable of preservation; and many others are of such nature that it is impossible to have very many of them around, unless

you own a hall; they are too bulky, and are not pleasant company for non-medical folks. Without your camera they are lost to you. But pictures will record them accurately, and preserve them in small space. In Figures 3 and 4, I have shown two of my interesting relics.

SCIENTIFIC WORK

Every medical man, no matter how commonplace his work or how humble his station, must occasionally have clinical material in his practice and thoughts in his head, that are of value



Figure 3.
Museum Specimen. Extraordinary Appendix.

to other medical men. He is not modern nor progressive, nor fulfilling his widest duty, unless he occasionally publishes something in a medical journal. The value and interest of such articles is enormously enhanced by suitable illustrations. The reader always turns more readily to an article that is illustrated, and the chances are he accepts its arguments and remembers them, much better.

Likewise, every progressive medical man presents a paper before some professional society, occasionally if not oftener. The general run of these papers have a tendency to be pretty dry listening. It is quite remarkable how an audience will prick up its attention when a few good lantern-slides are put



THE LONELY GRAVE

DR. J. B. PARDOE.

on the screen to illustrate a paper that is being read. It used to be the custom, when presenting such papers, to hang up great paper charts with figures painted on them. How much more effective and less cumbersome is it, to make up the material photographically into lantern-slides and project them on a screen before your audience!

The up-to-date professional man to-day recognizes that it is his duty to report to the profession in its technical literature,



Figure 4.
Blood-clot Pressing on the Brain.

any of his observations or devices that may be of value to others. In reporting his cases and his methods, there will be numerous matters that can be expressed only imperfectly and with much encumbrance in words, while a picture flashes the idea across at once. Visible physical signs, physical lesions and deformities, peculiar apparatus or instruments, and the technic of their use, are often far better expressed in the universal language of pictures, than by verbal description. My little apparatus in Figures 5 and 6 seems much more real



A CHAT IN THE PARK AT NIGHT.

LOUIS F. BUCHER.

to the pathological reader interested in new methods, from the photograph, than they would from any kind of description.

HANDLING PATIENTS

In giving directions to patients and nurses for carrying out various procedures, pictures are indispensable. Very often a doctor's treatment fails because the patient has not grasped the idea, which to the doctor seems so easy and clear. For

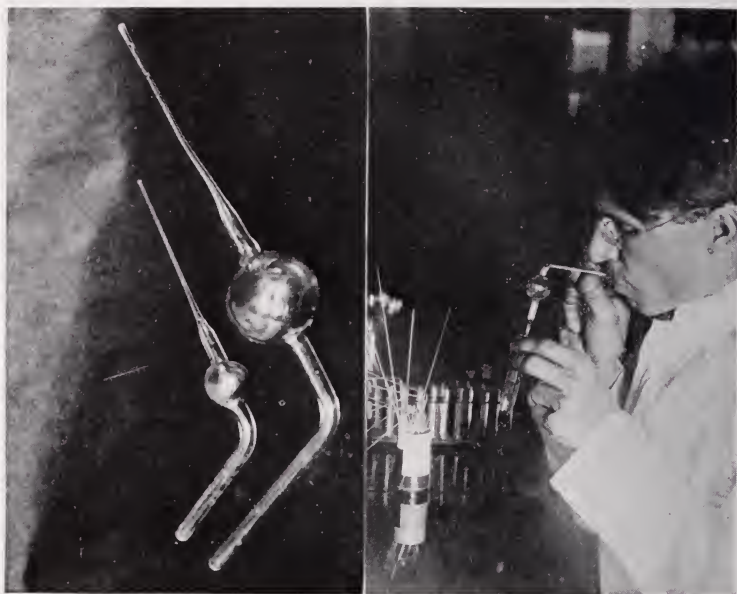


Figure 5
An Original Piece of Apparatus, and How to Use It

instance, I have a set of exercises that I prescribe for certain cases. I hand the patient a print (Figure 7) showing how these are to be done; and two hours explanation would not convey the idea to her as well. Besides, I have found it a considerable stimulus and encouragement to a patient to have before her eyes the picture of a well-formed model assuming the correct positions easily and gracefully; it urges her toward an ideal in a way that the physician's talk could never accomplish.

Again, I have pictures of the way in which babies should be handled and dressed, and the kinds of milk-bottles that



THE COMING OF SPRING.

LOUIS A. DYAR.

should be used and should not be used; these I have filed in a card-index drawer in my desk, so that I can put my hand on them instantly, when I need them in talking to a patient.

I have given a brief sketch of the way in which photography can be useful to the general practitioner. My friend, the G.P., will read this and say: "That is all very well, but it takes either so much trouble, or so much expense, to get these pictures, that the advantages are not worth it." He will say this because of his misconception of the amount of trouble it takes. It actually takes very little. The main obstacle is in the mental attitude, and the greatest trouble is in getting your mind ready and willing to do it. The actual work amounts to very little. Let me tell you how I have been doing it; and I am as busy as the next one.

At present, I use a 4 x 5 Graflex, but I have made many quite creditable pictures with a small pocket film camera. A good lens is a *sine qua non*. Mine is an F/4.5 anastigmat. Many clinical photographers use a 5 x 7; but I feel that a 4 x 5 print will show everything as well as the larger print will show it, and if desirable, it can be enlarged to any size. The 4 x 5 has the advantage of being less cumbersome, less expensive, and admits of work at shorter focal length. My Graflex is a revolving-back auto, with a very long bellows extension, to permit of taking objects their natural size. I usually use it on a tripod.

The camera is always ready in the office. This is the secret of the whole business. In a hospital, one has sufficient control over patients and conditions, so that a picture may be planned. Not all of the interesting and valuable cases come to a hospital; in fact, the class of cases that comes to the private practitioner is so little described and reported that the need is at present far greater in the latter field. And private patients do not like to run around to a photographer, or even come back to the office to be photographed. You have to take advantage of the "psychological moment," and usually you have to manufacture the "psychological moment" itself; and then grab the picture while the grabbing is good. Then you reach for your camera and expose, and the record is yours forever. (Caution: Do not expose peoples faces in published pictures without their permission. Lawsuits might result.)



YOSEMITE FALLS, CALIFORNIA.

CARL KATTELMANN.

My illumination is a flashlight as a rule, with an Imp flashlight gun. By using the flashlight method, it is possible to standardize the conditions and work mechanically, thereby assuring a maximum percentage of good results. A fine-grained plate of moderately rapid emulsion, such as a Seed 26 is best for ordinary work; but many subjects will come up in which non-halation, orthochromatic, and panchromatic plates, with proper filters will be necessary.

Again, the average doctor will say: "It requires more skill than I've got, to get pictures that are any good." It is true that it requires some skill to get these pictures, but that skill

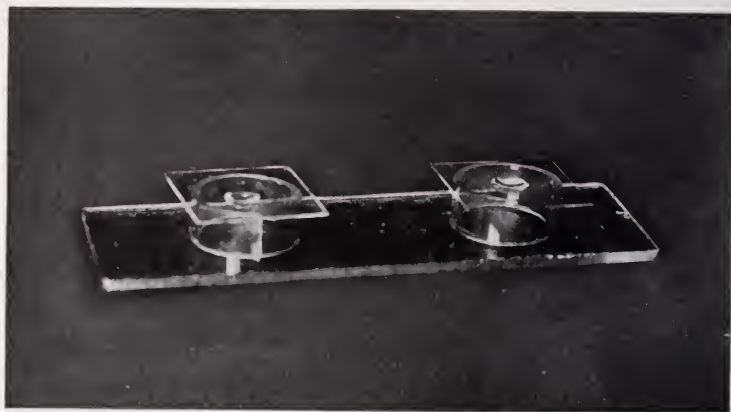


Figure 6.
An Original Device for the Laboratory. The Picture Explains It Better Than Words.

can readily be acquired. It is far simpler than many of the other things that a doctor is constantly called upon to learn and apply. The necessary skill can practically be said to consist in two things and no more: proper lighting and proper exposure. The proper exposure is not difficult. With a flashlight one can determine by a few trials, once for all, the proper conditions.

The trick of lighting is a little more difficult, because there can be no rule. Each picture has its own requirements, and each subject must be lighted in such a way as to bring out the particular points which constitute its reason for being photographed. Herein lies one of the main reasons for a doctor doing his own photography, unless he is so situated

that he can command the services of a technician who is thoroughly in sympathy with medical subjects. The average commercial photographer sees something totally different in your subjects than you do, and your picture as he makes it, often turns out quite disappointing. In Figure 1, A, in order to bring out the two remarkable depressions in the upper chest on each side of the sternum, that light had to come almost directly from the side. The correct position was found by watching the ground-glass, while an assistant manipulated a 100-watt Mazda electric lamp; and the flashlight was then



Figure 7.
Exercises. Directions for the Patient.

held in that position. In Figure 1, B, I wanted to show how the muscles on the left side of the neck stood out, and the usual 45° lighting seemed to give the best results; yet in Figure 1 C, an almost identical pathological condition, on the opposite side of the neck gave much the best result with the light very nearly straight in front, and very low.

The "finishing" of the pictures is a secondary matter. The doctor who loves photography for its own sake, will find it no problem. To him I would suggest that the time-and-

temperature system of tank development is the only scientific and accurate method. The doctor who has a laboratory technician, can readily teach her to do his finishing; that is far easier than the blood-counts and Wassermann tests which she is supposed to be able to do properly. Or, the picture can be taken to a photographer to be developed and printed. Only, in this respect, let me speak a word of caution. Do not take them to the average "kodak finisher." That man, in most cases, lacks skill and insight; he is after popular effects with white borders and much contrast, and he will murder your detail and massacre your gradations. Take them to a good commercial photographer. I enjoy developing my own plates, but usually leave the printing to a commercial photographer.

Here are some of the subjects that will come up in this sort of work, and a few hints as to how they should be handled.

PATHOLOGICAL LESIONS

Physical deformities involving mainly shape considerations, can be handled on an ordinary plate. But open wounds, skin eruptions, and discolored conditions may or may not require orthochromatic plates with filters. Whether or not you require color-sensitive plates and filters depends, not on the color of your subject, but on what your picture is supposed to show. If you want to bring out a red eruption on a white skin, you will get a better result on a color-blind plate without a screen; the lesions show up dark against a white ground. On the other hand, if you have a wound or an operation, and your tissues are red and yellow, you cannot bring out detail unless you have a panchromatic plate and a K-3 filter. It is not true color values that we are after at all; it is after distinctions that will bring out particular points.

PATHOLOGICAL SPECIMENS

When fresh specimens are being photographed, the above remarks concerning plates and filters apply. Preserved specimens have lost their color, and can be handled on ordinary plates. As a rule, unless there is some feature about the fresh specimen which is lost by preservation methods, it is best to defer the photography until the preserving fluid has hardened and whitened the specimen.

There is a simple little dodge which will improve pictures



DRAGGING FOR SMALL BAIT.

R. B. M. TAYLOR.

of pathological specimens to such a wonderful extent, that no one should omit it. Photograph the specimens under water. This does away with distracting spots of reflection from wet surfaces, with drops of fluid adhering to the specimen; it preserves the shape of the specimen and the proper appearance of small tags and threads, and little loose portions of tissue. The latter will droop flabbily in the air, while under water they will float out to a very natural position. Figures 3 and 4 illustrate this; photographed in the air, they would have appeared flabby, wrinkled, misshapen, and shrunken. Rendering of detail and texture is also much improved. (I am indebted for this idea to Dr. Wilson of the Mayo Clinic). The surface of the water must be kept free from scum or bits of floating tissue. The dish must be absolutely stationary, to avoid currents in the water, which would cause movement in parts of the subject. The camera and light must be so placed as to avoid reflections from the surface of the water. There is no particular practical difficulty in any of these points. The work is best done in a glass vessel with a black bottom; opaque screens can then be placed wherever needed to control the lighting.

APPARATUS AND INSTRUMENTS

Non-halation plates are necessary wherever glass or nickel-plated objects are included in the subject. Be careful of the background (and this applies to all classes of subject); it should be either black or white to contrast properly with the subject, and perfectly plain. It should not be wall-paper nor the side of a house, nor some piece of furniture that is not part of the discussion. I use an old focusing-cloth and a sheet of white muslin, which I keep rolled on a pole when not in use. When gray backgrounds are necessary, sheets of mounting paper are the most convenient.

TECHNIC OF MEDICAL METHODS AND PROCEDURES

How to handle a certain instrument, how to apply a certain dressing, can often be told better in a picture than in words. Such a picture must be posed, yet it must not look posed. It is seldom, if ever, possible to walk up to someone performing the act, say a nurse giving a treatment or an assistant making a test, and take a snapshot of it and expect a good picture. The group and setting must be arranged for the



BELLE JOHNSON.

occasion, and the objects and persons posed to bring out the idea. However, the people in the picture should endeavor to look as though it were real business; and the only way to achieve that is to forget that a picture is being made, and feel that they are actually at work.

COPIES

The man who writes articles or lectures, will frequently want diagrams and charts photographed. Especially for purposes of lantern-slide presentation, he will frequently require copies from books, typewritten tables, sketches, cards, etc. Copying is a subject that is abundantly treated elsewhere in photographic literature, and I shall dismiss it here with the statement that process plates and artificial light, with careful records of exposures, will enable you to standardize your conditions, and get good results every time. A flat-field lens, like an anastigmat, will save much time and trouble. Special contrast developers are advisable.

PHOTOMICROGRAPHY

This is one of the most fascinating fields into which photography will lead the doctor. Its technic is also a subject by itself, and is adequately handled in numerous books and articles in photographic literature as well as in medical literature. (The Eastman Kodak Company's complimentary booklet on the subject is excellent.) In medical work, photomicrographs are usually of blue or purple nuclei on a red or pink ground. Therefore, a panchromatic plate and a yellow filter are necessary to bring them out. When specially-stained sections are being used, filters must be varied to produce a result that will give the same idea as looking at the section. Thus, in photographing a Ziehl-Nielsen stain of tubercle bacilli, it would be advisable to have the red-stained bacilli stand out black against the blue background; for this a blue screen or green screen would be required. Even when non-stained subjects, such as urinary sediments are being photographed, an orthochromatic plate with a yellow filter should be used, because microscopic objectives are not corrected for color. Their image, as we focus it with our eye is mostly of yellow rays, and does not coincide accurately with the upper-spectrum image to which the ordinary plate is most sensitive.



REFLECTIONS.

ROBERT R. MC GEORGE.

STEREOSCOPIC WORK

This is not very commonly used by clinicians, though pathologists employ it more frequently. The power of stereoscopy in bringing out shapes and space relations, however, is a very valuable thing when we are trying to depict some complicated apparatus, or operation, or some specimen difficult of description. For this class of work, it must be kept in mind that when small objects are being photographed at close range, the ordinary stereoscopic camera will exaggerate the perspective and give a distorted appearance. The ordinary separation of the lenses is too great for natural effect, and lenses closer together must be used. In the hands of the average physician, the expense of a special camera for this purpose, with adjustable lens-separation, is not warranted. I have arranged a stand for this purpose, which enables me to accomplish the same result with one lens, by swinging the camera through an angle, the size of which depends on the focal distance. It is swung on a board which acts as a radius of the angle, its center being at the object photographed. An article of this length does not permit of further details of the construction of the apparatus, or of the angle to be used.

The usefulness of photography to the doctor will be considerably augmented by a proper method for filing prints and negatives. Hundreds or thousands will soon accumulate; many of them will not have their usefulness exhausted on the first occasion of their use. If we want them again, it must be possible to lay hands on them at a moment's notice. My print file is an album, which is likewise a very interesting little museum of technical and pathological studies. For methods of filing negatives, see one or more of the numerous articles on the subject in photographic books and journals; I am only urging that some system be adopted and adhered to.



NOT SO "PACIFIC" THIS EVENING.

W. C. SAWYER.

PICTURES THAT TELL A STORY

By GEORGE W. FRENCH



ONE of the first signs that an amateur photographer is passing out of the snap-shot stage into the broader field of the few who really try to make interesting pictures, i.e., pictures that are interesting to other people than themselves, is the production of prints in which the human figures depicted are apparently unaware of the presence of a camera. Such pictures are unlimited in their variety, nor do they call for long walks in search of fitting subjects. Wherever one or more people can be found, there is the material for a great variety of exposures. A camera, tripod, plates, knowledge of composition, and common sense will do the rest.

Pictures that tell stories, scientifically known as Genres, make pleasant many hours of our lives that would otherwise be devoid of interest. Electric cars are now picture galleries of story-telling pictures. Advertisers cannot properly present their goods without them, and thus we could proceed mentioning many phases of human activity in which these kind of pictures play an important part.

Now, to get down to the fundamentals of genre work. We all delight in such pictures as important plays in a football game, the finish of a race, etc., all of which require a fast lens and a quick eye, but many of the world's most popular works of art are pictures that represent phases in the daily work of man, or the tireless play of children. Take for instance Millet's "The Angelus," and Raeburn's "Boy with Rabbit." Such pictures as these, if posed for the camera, would not require a speedy lens. So, no one who loves to take pictures should let the lack of one of the fastest lenses deter him from going into this interesting branch of photography with the intention of producing pictures that will demand the attention and even praise of his friends.

In preparing for genre work we should first learn the principles of composition. By so doing we shall avoid such common blunders as the following:

1. Having two figures some distance apart with the same



KELLY'S ALLEY.

ARTHUR D. CHAPMAN.

intensity of lighting. Caution 1. The principal figure should be most strongly illuminated, or should wear the lightest clothes. All others should be subdued in tone.

2. Representing a figure as walking out of the picture. Caution 2. Always have more space in front of the principal figure than behind it.

3. Having the figures so small that, according to art principles the picture comes under "landscapes with figures" rather than genres. Caution 3. The principal figure in a genre should occupy a space at least equal to one-quarter of the diagonal of the picture.

4. Having a lack of harmony between the figures and the surroundings. Caution 4. Ordinarily the figures should be dressed in accordance with the requirements of the work which they are performing. For example, a ploughing scene should contain a typical farmer, not a person with high collar and starched shirt. The theme should coincide with the setting. Common sense should be a sufficient guide in this respect.

5. Having the picture all out of balance. Caution 5. Let the principles of the old fashioned steelyard govern the arrangement. The more important object should occupy the larger space. The secondary object the smaller, and so placed as to balance the larger. Other principles to observe are as follows:

Figures should be so placed as to represent the qualities that you are aiming to illustrate. For instance, if vigorous action is the motive, study to place the figure or figures in a position which will make it evident that force is being used. Positions that produce slanting or curved lines will best serve this purpose. Slanting lines are always stronger than horizontal or vertical lines if action is being depicted.

The principal object should never be placed in the center of the picture space, for this is the weakest point.

Figures should be connected in some way by strong lines, unless in juxtaposition. It is an old rule in two-figure genres that two profiles, two three-quarter, or two full face figures rarely look well. Variety is needed, therefore a profile and a three-quarter face look better, or a three-quarter and a full face. Even a differentiation of tone in the ground-work between two figures will serve as a connecting line.



AN OHIO ROAD.

Lawrence Baker.

If three figures appear in the composition two of them should be in juxtaposition, or else their heads should be in an irregular line. Figures must form unity.

Care should be observed in selecting the background. Ordinarily there should not be extreme contrast between figures and the background, nor should the background contain anything that will attract the attention from the figures. No object should be allowed to coincide with the heads of figures in such a way as to produce what appears to be monstrosities such as tree trunks protruding from the top of the head, etc.

All objects of any count should be so arranged that they form of themselves, or with the principal object, an irregular line such as a slant or a curve.

Human figures should not be so placed that their heads are in the same horizontal plane.

In posing figures to get the best expression suggest that they proceed with the work until you give a signal to hold, then make the exposure. Always try to take such pictures at the critical moment when the actors, conscious or unconscious, seem most interested in the work which they are doing.

Genres of children are harder to secure except with the faster type of lens, but after much practice, very pleasing results can be obtained by being patient and alert.

Much more could be written about this important branch of photography, but the points most essential to correct genre work in respect to composition and story telling qualities have been covered.



SHAKER PARK.

Illustrating article "Stereoscopic Photography," by C. H. Shipman.

STEREOSCOPIC PHOTOGRAPHY

By C. H. SHIPMAN

DO you remember the happy, interested hours we spent, when visiting our grandparents, viewing the "World Before Our Eyes" through the stereoscope? No pictures since have been able to produce the lasting impression made by those views, or give us as accurate an idea of the objects pictured.

With the advent of the "Photography made easy" methods, interest in the stereo waned, and those old scopes and views were relegated to the attic. Within the last few years interest in the stereo view has been revived, and it is time for us to bring the old stereoscope and views from their hiding place, dust them off, and add them to our collection of photos.

Our renewed interest will make us wish we might have views of our friends and favorite scenes. Nothing more simple. Let us go to the dealer and procure a stereo camera.

We have a considerable choice, 45 by 107 m.m., 6 by 13 or 7 by 13 c.m., or 10 by 15 c.m. with high speed lenses and fast shutters, or 45 by 107 m.m. with single lenses and a sliding shutter, at prices from \$15 to \$500. Or we may procure a



ELLIOTT STUDIO.

Stereo Kodak or Graflex, or one of several models of 5 by 7 hand cameras which are adapted for both stereo and full size pictures. Most of these cameras use plates, or cut film, or film packs. A few use roll film, but lack the advantage of the ground glass.

Since the scopes that we have rescued from the attic are standard size, let us obtain one of the 5 by 7 hand cameras with stereo lenses and removable division. The half of a stereo print is $3\frac{1}{4}$ in. high by $2\frac{7}{8}$ wide, therefore it will be well to rule the ground-glass as an aid to composition of the views.

Now, we load holders or pack adopter and away to one of our favorite haunts. We choose a view including both near and distant objects, level the camera sidewise, focus on a point about 25 feet away, stop down until everything is sharp and give a full exposure. After taking two or three more views, we return to the darkroom to develop. This process needs care as any defect in the negative stands out upon the print in most unpleasant manner. It is very difficult to spot a stereo negative so that it will not show in the print. We must use a soft working developer as much contrast is fatal to good results.

When our negatives are dry, comes the question of printing. As a rule it is best to use a glossy paper, which may be die cut if we have a self transposing printing frame, since the prints must be transposed. Lacking this frame we may print direct and afterwards trim and transpose the prints when mounting. In this case with pencil draw a long oval on the back of the prints, or otherwise mark them, so that they may be identified and paired and transposed properly. Each print should be trimmed to $2\frac{7}{8}$ in. wide and $3\frac{1}{4}$ in. high so that the print to be mounted on the right will be trimmed about $1/16$ in. more to the left than the other. Trim the bottom edge first, being careful to cut parallel to the like objects in the two views. Then cut the views apart and finish trimming. Mount the prints close together on a stereo mount which is $3\frac{1}{2}$ by 7 inches. Use both sides to save space and expense.

If film negatives are made, a good way is to cut a mask 5 by 7 inches outside with two openings $3\frac{1}{4}$ in. high and $2\frac{7}{8}$ in. wide with a $1/8$ in. strip between. Cut the films apart and mount the left one on the right opening, having the glossy side of the film up. Fasten with bits of lantern slide tape.



THROUGH FOG AND MIST.

P. F. SQUIER.

Put the mask on a 5 by 7 glass, place in the stereoscope, and slip the other half film about until the result is correct, then fasten it down too. Now print direct on a 5 by 7 inch sheet of double weight paper and trim to $3\frac{1}{2}$ by 7 inches. Dry mount two such prints together back to back.

If dark borders are preferred, double printing must be employed. Cut the openings in the mask about $3\frac{1}{8}$ in. wide and $3\frac{1}{2}$ in. high; cut two forms $2\frac{7}{8}$ by $3\frac{1}{4}$ in. and mount on glass or a clear film so as to protect the pictures when printing the border. Be sure both negative and border masks register into same corner of the printing frame. After printing the picture, print the border long enough to secure a good black.

The above instructions apply to any size stereo with proper changes to allow for size of view and separation of lenses, both taking and viewing. For the small sizes, transparencies are better than prints, but necessitate the use of a transposing printing frame, or purchase of a stereoscope with reversing prisms.

The stereo is now widely used by physicians, medical colleges, public schools and the commercial world. The stereo view shows three dimensions and gives the illusion of correct size, and is valuable in any line of endeavor requiring these features.



WADE PARK POND AND THE MUSEUM OF ART, CLEVELAND, O.

Illustrating article "Stereoscopic Photography," by C. H. Shipman.



IRVING S. LOVEGROVE.

KNOW THE LIGHT

By RALPH S. HAWKINS



BELIEVE that the greatest number of photographic failures are directly traceable to errors in the exposure of the sensitive plate or film. If photographers would come to a realization of what an important relation exposure bears to the securing of desired results and effects, it would advance the progress of photography more than any other one thing. This may seem a very broad statement to make, but I think that the countless number of failures that can be definitely traced to this cause will bear out my contention.

Correct exposure is a relative term—within certain reasonable limits—and is more or less directly dependent upon the subsequent treatment of the positive, and the results or effects that it is desired to produce. But we must go farther than just correct exposure—we must acquire the habit and the knowledge to work understandingly. We must be thorough technicians, and we must know the possibilities and the limits of our medium. We should aim to produce the results and effects we desire, rather than accept the results that we obtain through aimless efforts. I have seen an under-exposed film, made by the veriest tyro, enlarged by a skillful worker through a soft focus lens and handled in a low key, that resulted in a very pleasing moonlight effect. And I have seen this same procedure followed by so-called serious workers—men regarded as pictorial photographers—but I decry the practice. It is aimless work, and does not develop the highest conception of artistic expression, or photographic technique. We would not long tolerate a building contractor to proclaim himself as such, who would take the plans and specifications for a seven room bungalow and construct a building that resembled a public garage. His explanation that he had made a few errors here, and a few mistakes there, but that the resulting building could be used for other purposes, would have little weight in establishing him a successful contractor. Yet we continue to encourage photographers to just such inane and idiotic things.



WILLIAM SAUTER AS IAGO.

Oscar Maurer.

There is no process in photography that is entirely mechanical—that is apart from, or lacks, the personal element, and it behooves us to know and to apply our knowledge understandingly to each successive step in the making of a picture. The first problem that confronts us for solution is the correct exposure of the sensitive plate or film.

Photography is the recording of light intensities, and when we make a photograph, we record the light intensities that are reflected from the subject through the lens, and onto the sensitive surface of the plate or film. We know that the light varies in intensity throughout the seasons of the year and the hours of the day, being brightest in the months of May, June and July, and between the hours of ten in the morning and two in the afternoon. We know that plates and films vary in sensitiveness according to the brand and make, but that each brand may be relied upon to be practically uniform in sensitiveness, and that a little experimenting will enable us to know what that sensitiveness is for all practical purposes.

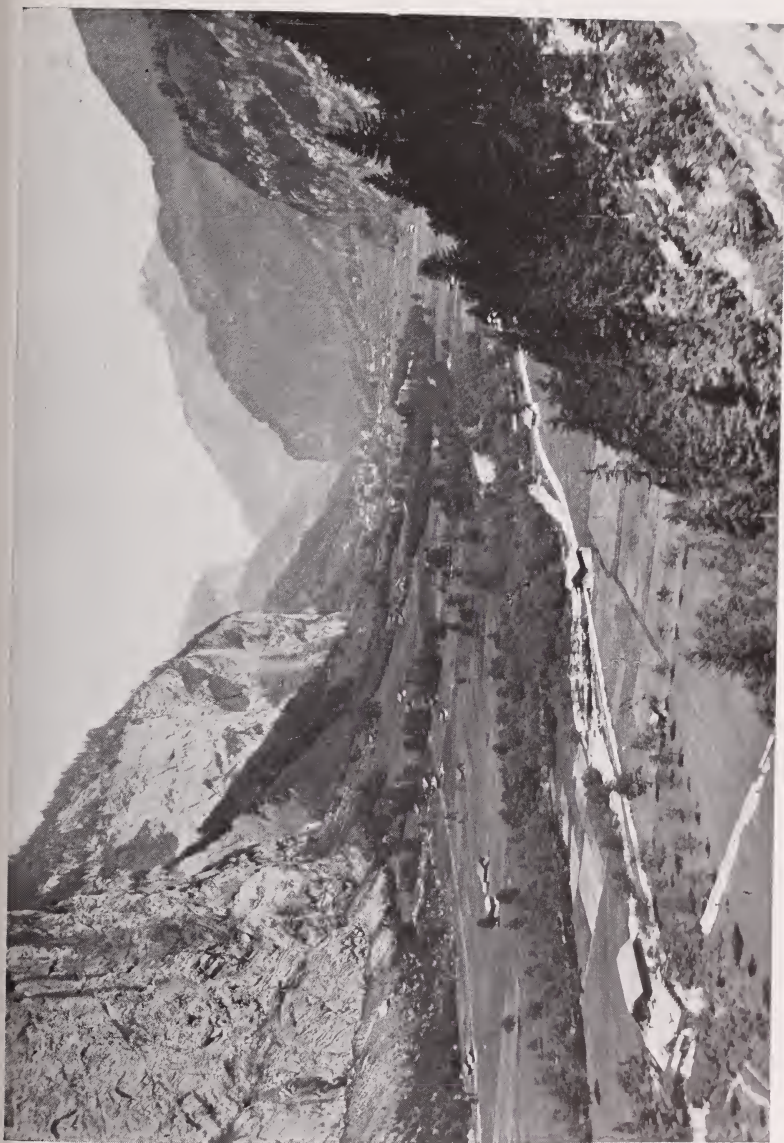
We have then, three principal factors to consider in determining the necessary exposure required for making a picture. They are: First—The intensity of the light. Second—The amount and intensity of the light that the subject reflects. Third—The “speed” or sensitiveness of the plate or film. The first of these factors is of a variable nature, and must be calculated for each separate exposure. The second factor is largely dependent upon the first, and constitutes the personal element in the equation. It must also be considered for each individual exposure. The third factor is the only one that we can safely consider as a known quantity.

Let us consider for a moment the procedure of the average photographer in determining the necessary exposure to give his plate. The subject is selected, the view point established and the camera set up. The picture is composed on the ground-glass and properly focussed. The lens is stopped to the desired aperture. This done, the photographer studies the character of the subject and the general conditions of the light. Then with his head under the focussing cloth he notes the illumination of the subject on the ground-glass, which he attempts to compare with a standard degree of illumination that he carries in his mind. He attempts to make this comparison while his eyes are still adjusted to the more brilliant light outside the

focussing cloth. Would you vouch for the accuracy of his judgment under these conditions? We all know the apparent state of blindness that we experience when we enter a motion picture theatre from the bright light outside. It is a matter of minutes before we can distinguish anything but the brightly illuminated silver screen. After a few minutes the eyes adjust themselves to the subdued light and we can see more clearly—in fact we can see everything about us and there appears to be much more light than when we first entered. This same condition is present when we are making our comparisons of the illumination under the focussing cloth, and it is one of the prime reasons why photographers secure such widely varying results in the character of their negatives.

I have a friend who has made photography his "hobby," and he has devoted most of his spare time during the past six years to the making of pictures. He is a serious worker and a close student of the art—the same as many other amateurs who are trying to express themselves through the medium of photography. My friend was showing me some of his prints recently, and I could not help noting his remarks as he handed me each successive print. "I had waited for weeks for a certain atmospheric condition to express just what I wanted in this one, and one Sunday morning the conditions were just what I had been looking for. I made two exposures to be sure of getting just the effect that I desired. One was badly overtimed—this one would have been better with less exposure." Again: "I like this subject—the composition and lighting are especially pleasing, but the plate was badly under-timed. I am keeping this print for future reference, as I am going to make it over again some time." And so on throughout the list. If my memory serves me correctly, there were just three prints in that lot of twenty-odd with which he was satisfied—fourteen per cent! We talked "shop" the rest of the afternoon, comparing our methods of working, and the general run of conversation that usually follows the getting together of two camera fans.

That night I was thinking over the afternoon's visit and I made a mental inventory of my friend's photographic assets, which I may briefly summarize as follows: He is very artistic—quick to see the pictorial possibilities in a subject, and with a charming sentiment and feeling which he strives to express



A SWISS VALLEY.
LOOKING TOWARDS LAUTERBRUNNEN, SWITZERLAND.

HOMER S. CURTIS.

in his work. He is a careful and painstaking workman and a close student of things photographic. He knows just the effect that he wants and he is not satisfied until he has produced it. He is fairly well versed in the technique of photography, and is a constant reader of good and authentic photographic literature. And yet in his work he has failed in one of the most important things—he has failed to analytically apply the knowledge that he has. Let me explain just what I mean by a reference to the print first mentioned above. The subject was a landscape with some well-placed trees in the foreground and a most charming distance. The whole effect was beautified by the fog or haze that produced a wonderful atmospheric effect and really made the picture. To hold this distance in just the right degree of gradation was the whole problem in making the picture. The use of a light color screen would have made this a comparatively simple matter—K-1 would have been right—but in his hurry to make the exposure before the fog lifted, he had neglected to take his filters. To hold the distance without the filter would have necessitated a shortened exposure—slightly under-timed, which my friend informed me he thought he was giving, but he was not sure what the normal exposure should have been. He guessed.

With his plates exposed he hies himself to his dark-room to complete the first step towards his picture—the negative. He uses the tank method of development, and follows the maker's instructions to the letter. Thus we find him preparing his developer, weighing each ingredient to the exact grain. The water is measured to the required minim, and the whole concoction brought to the standard sixty-five degrees of temperature. The "book" calls for a full twenty-minute development, which he proceeds to give and settles himself for this period of happy expectancy while the "experience in the tank" performs the miraculous transition from plate to negative. And then there comes to his vision a lot of negatives, varying in the qualities desired as widely as the peoples of a city vary in their resemblance to each other. And the sad part of the story is that the greater proportion of the negatives are of the undesired quality. My friend is no different in this respect than hundreds of other amateurs—and professionals—who work entirely according to rule in a mechanical way and fail to apply their knowledge to the conditions at hand. They do not work understandingly.



JES' A BABY.

JESSIE TARBOX BEALS.

And what lesson are we to learn from this? It is that we do not apply the knowledge we have, or that we have not the knowledge to apply. We are too prone to guess when we could be reasonably certain, and the most dangerous of these practices is the habit of guessing the actinic value of the light. In the example mentioned above, my friend would have been a lot more certain of success had he measured the value of the light, and computed his exposure correctly, and been less accurate in regard to his developer. He might better have taken a pailful of water, a spoonful of pyro, two handfuls of sulphite, a handful of carbonate and with a correct exposure he would not have gone far wrong in securing a negative. But he guesses with the factor of most importance, and it is not to be wondered that he gets negatives of varying quality and all sorts of prints therefrom, for in a measure he is working in the dark.

There would be some excuse for all this waste of time and energy, and we would sympathize with those working in the dark, if it were impossible to correct these errors. We can measure the light values with enough accuracy to insure uniform results and to make success fairly certain. There are numerous tables and exposure charts that give the values of the light for different seasons of the year, and the different hours of the day, that will be found a great help in calculating correct exposures, but they fall far short of being exact under the varying atmospheric conditions. The most reliable means to this end I have found to be the type of meter that makes use of a chemically prepared paper that is sensitized to register the strength of the light which alters the color of the paper in the degree that the light is actinic or non-actinic. Such meters as the Wynne, Hunter, Adams and Watkins are of this type, and will be found wonderfully accurate in this respect.

I have been professionally engaged in photography for the past twenty years and I cannot recall the time that I have been without a meter of this type. I use it—I rely upon it. There have been numerous times that my judgment has questioned the accuracy of the meter, and I have always found that my judgment has been in error.



GRAND CANYON OF THE COLORADO FROM THE NORTH RIM.

GEORGE L. BEAN.

HOMEMADE APPARATUS FOR ENLARGING NEGATIVES

By RALPH GOODALE



IN the 1914 issue of the *Annual*, A. E. Swoyer published a valuable article on the making of enlarged negatives. His method, in brief, was to place a small contact print in a post card projector, and to project an enlarged image from it upon a dry plate. Mr. Swoyer claimed that an enlarged negative preserved all the detail of the original negative, and that manipulations were more easily made upon the small contact print than upon a bromide. He was right. A bromide print does not compare in detail with a contact print from an enlarged negative; and the retouching, shading, and masking performed upon a small print, when caught upon a large plate, become for the future as automatic and simple as the printing of any detail in a contact print.

I would add that with an enlarged negative the final picture is not limited to bromide, but may easily be made in carbon, gum, seltona, or any other medium; that the small additional cost of the large dry plate is little, for most amateurs, compared to the usual cost of wasted paper in the bromide process; that amateurs who are devoted to the carbon process may avoid the double transfer by reversing the image on the enlarged negative; and that the exposure in the making of an enlarged negative may be accurately determined by a simple calculation.

Having no projector, I have made one of my own, shown in Figures 1 and 2; a small print, pinned upon the support in the window, receives the light from two 50-watt bulbs. My camera, with the back removed, rests upon the bracket and partly within the hood; the lens is properly focussed to throw an enlarged image of the picture upon a plate, which stands upon a movable easel.

If you care to imitate this device, make of good inch boards a box about as wide as the focal length of your camera lens, twice as high as wide, and twice as long as high. In case



RURAL WORKERS.

C. E. WAKEFORD.

you do not know the focal length of your lens, make the box as wide as your box camera is long, or as wide as your bellows is long, when the pointer is at the "infinity mark."

Before nailing the box together, however, construct the combined hood and bracket shown in Figure 3, with an opening just large enough to permit the insertion of the camera-body when the back is removed. The hood should measure,

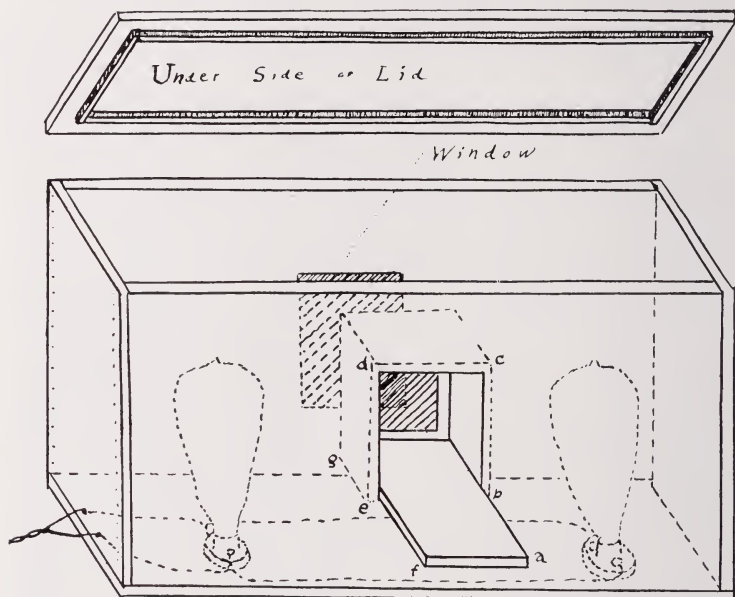


Figure 1.

from *c* to *g*, one-third the distance across the interior of the enlarging box.

With a box camera, focusing is accomplished by sliding the camera back and forth in the hood, with the lens pointing whichever way is suitable. The hood should be as long as the box of the camera, and must run through the front wall of the projecting box for half its length.

Cut in the center of the front board of the box a hole as wide as the opening in the hood, and as much longer as the thickness of the bracket *a b e f*. Insert the hood from the side that is to be within the box, with the bracket projecting and the edges *b c d e* flush against the front board. Nail the

hood in place, taking care that the bracket stands at an exact right angle to the board. Cut from hard rubber, red celluloid,

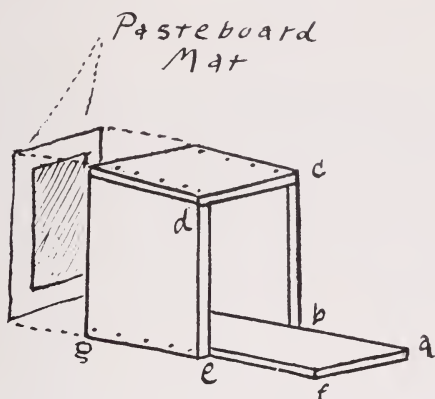


Figure 3.

or black paper a mat as big as the rear of the hood, with an opening a little smaller than the back of the camera, and glue it to the back of the hood.

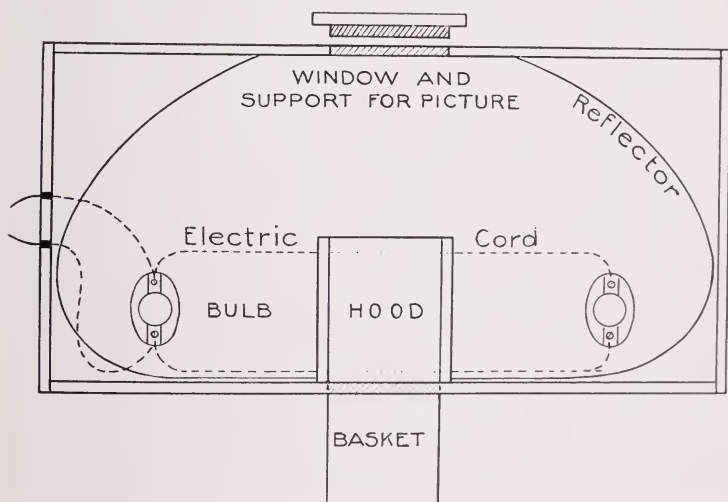


Figure 2.

In the center of the back board of the enlarging box cut an opening a little larger than the pictures made by your camera. This opening is for the insertion of the picture to

be enlarged, and should be directly opposite the hood in the completed machine. Save the block of wood from the opening, and glue it to a board an inch or so wider each way. You now have a support to which the pictures may be pinned, and which may be hinged to the opening like a door or merely fastened with snaps. If you prefer, you may omit the window altogether, and pin your picture to the inside of the back wall of the box.

On the bottom board screw two keyless electric sockets, one near each end, in such a position that the lights which they hold cannot shine directly into the hood. Wire the sockets in multiple, as shown in the diagram.

Now, paint all the wooden parts a dull black, both faces and edges, and nail the box together, using glue to tighten the joints. Leave the upper board loose for a cover, and fit small wooden strips on the under side near the edges to prevent the escape of light; if necessary, glue strips of felt on the lid where it meets the edges of the box. Run the electric cord through holes in one end of the box and join them to an electric plug.

For reflectors, cut white cardboard strips as wide as the inside depth of the box, and tack them in a curve so as to throw the light upon the picture. Remember that there should be no white object in a position to shine upon the lens.

Figure 4 shows a convenient easel. A small brad in the plate rest will hold the foot of the plate, and a sliding sleeve of black pasteboard, slightly notched, or of sheet iron, will hold the top. Paint your easel a dull black.

For a focusing screen, paste white paper over a discarded plate of the proper size. Rule the screen in black with cross lines parallel to the edges and a quarter of an inch apart. In the same way rule in red ink the black surface of your print carrier. By focusing the red lines upon the screen you may determine whether your easel stands properly, and also decide upon the degree of magnification at any particular distance from the box.

I prefer Solio or Disco for the small contact print; P.O.P. has greater latitude than developing papers, and the smooth surface offers no irregularities to show in enlargement. A slow plate, with its great latitude and its fine grain, is best for the enlarged negative. My favorite is the Cramer Process Plate.



T. W. KILMER.

It will be well to make a trial exposure at a certain magnification and a certain lens opening. By holding a paper before the plate while the exposure is going on, and moving

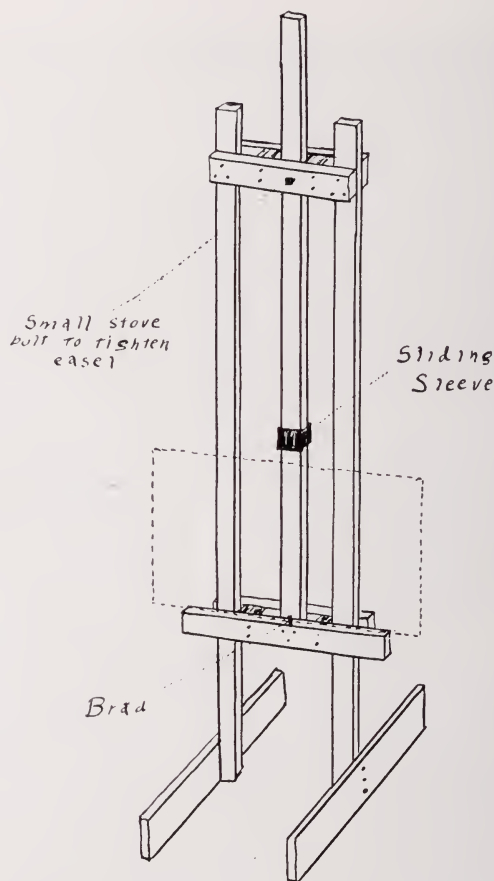


Figure 4.

it sideways at intervals of fifteen seconds, you may produce a graduated negative, one part of which will be perfect and will indicate the correct exposure for the given magnification and lens opening. Once the correct exposure under the given conditions is determined, you may easily make a chart that will indicate the time for any exposure; provided, of course, that you always use the same kind of plate and the same



AT DAWNING.

CHAS. C. CAREY.



ASTERS.

JAMES THOMSON.

size of lamp. In order to work out the chart for yourself, use the formula
$$X = n \frac{(1 + M)^4}{M^2}$$
, in which X is the time, in seconds, M is the number of magnifications, in diameters, and n is a certain number.* Suppose, for instance, you find that at $F/11$ for your lens the exposure time for three magnifications is 225 seconds. Then $n \frac{(1 + M)^4}{M^2}$, or $n \frac{(1 + 3)^4}{3^2}$, = 225, and $n = 7.9$; or for practical purposes $n = 8$. You may now

*That is, a picture two inches across, when enlarged so as to measure six inches across, is enlarged three times, and $M=3$.



PORTRAIT OF A GIRL.

Irving Berkey.

find the exposures for all values of M, using the stop F/11; and after that you may determine the exposures for other stops by the formula. The time varies with the square of the lens opening expressed by the focal system (or with the lens opening expressed by the uniform system).

If you are busy, however, or unmathematical, use my table, after multiplying all the exposure numbers by whatever figure you find necessary. Suppose, for instance, that your correct time for a three-times enlargement at F/11 is 175 instead of

210 seconds: multiply all the numbers by $\frac{175}{210}$, or $\frac{5}{6}$.

No. of Magni- fica- tions	Lens openings, U. S. (approximate openings, focal system, in parentheses)					
	(F6/8)	(F4/8)	(F8/11)	(F16/16)	(F32/22)	(F64/32)
	Time, expressed in minutes and approximate fractions					
1	$\frac{3}{4}$	1	2	4	8	16
2	1	$1\frac{3}{8}$	$2\frac{3}{4}$	$5\frac{1}{2}$	11	22
3	$1\frac{1}{3}$	$1\frac{3}{4}$	$3\frac{1}{2}$	7	14	.....
4	$1\frac{3}{4}$	$2\frac{3}{8}$	$4\frac{3}{4}$	$9\frac{1}{2}$	19	.....
5	$2\frac{3}{8}$	$3\frac{1}{6}$	$6\frac{1}{3}$	$12\frac{2}{3}$	.....	.....
6	$3\frac{1}{8}$	$4\frac{1}{8}$	$8\frac{1}{4}$	$16\frac{1}{8}$	.....	.....
7	$3\frac{7}{8}$	$5\frac{1}{8}$	$10\frac{1}{4}$	$20\frac{1}{2}$	.....	.....
8	$4\frac{3}{4}$	$6\frac{1}{4}$	$12\frac{1}{2}$	25	.....	.....

Fasten your chart to the lid of your box, and trust it; if your experience is like mine—and I waste a good many plates in other ways,—you will not lose a negative by over- or under-exposure.

SILHOUETTES BY PHOTOGRAPHY

By JULIEN J. PROSKAUER



IRTUALLY everything modern has had its conception in something of the days of old. Therefore, it is entirely fitting and proper that before we delve into the making of photographic silhouettes, we explain just what silhouettes are, and wherein they first found use and favor.

Years before the discovery of photography outlines of a shadow on the side of a wall were copied by artists on white backgrounds and used as pictures or representations of those throwing the shadows. After that came Etienne de Silhouette, French Minister of Finance in 1759, who made silhouettes by cutting shadow portraits from black paper with a pair of scissors. Silhouette made a fad of his knack of cutting pictures from paper, and the name of Silhouette was given to the finished result.

A silhouette consists of a uniformly dark image on a white ground, or a white image on a dark ground, though the former is more extensively in vogue today. Photographic silhouettes are easiest made to give the first effect, and that is what we will take up today.

Silhouettes by photography made by flashlight are the surest and easiest, though any kind of light suitable for photography may be used in making silhouettes. The writer, who has for years been interested in silhouette making the photographic way, always works with flashlight as the illumination source.

To make a silhouette, two rooms, with a doorway between are needed, if flashlight is to be used, and the writer will not presume other than that illumination will be used. The doorway must be wholly covered with white cloth (an ordinary bed sheet is used to best advantage). This cloth must be stretched smooth so that no wrinkles can possibly show.

The flashlight is placed in one room and the camera and subject in another. Pose the subject before the sheet facing profile to the camera. In arranging the subject be sure that no part of even the eyelashes nearest the sheet show, for if they



JOAN AND PAT. BREAD 'N' SUGAR 'N' MILK.

Illustrating article "Silhouettes by Photography," by Julien J. Proskauer.

do, the true silhouette effect is lost, and the exposure is of no value.

Place the flashlight so that an imaginary line drawn from the camera to the flashlight, through the sheet and through the subject, would be exactly straight. Notice the accompanying diagram (Figure 1)* and follow it in making silhouettes. You cannot go wrong.

"Joan and Pat" (Figure 2) under the title of "Bread 'n' Sugar 'n' Milk" won first prize in a monthly competition of American Photography, and a flashlight manufacturer wanted to buy the negative for advertising purposes. This is stated here simply to show that money may be made by silhouette makers because of the novelty of effect.

"Joan and Pat" was made on a 5x7 Portrait Film and

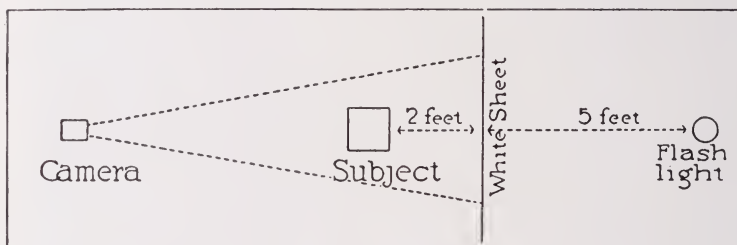


Figure 1.
Silhouette Arrangement.

developed in Pyro-Elon for the gradations of blackness in the heads and the illumination was a No. 3 Eastman Flashlight cartridge.

"Dick" (Figure 3) was made with a 3a Kodak and Portrait Attachment on regular Autographic Film. "Gretchen" (Figure 4) was made with the same Kodak. The illumination on these was a No. 2 Eastman Flashsheet.

The method of working on these three pictures was identical. A sheet was hung as mentioned above, and the subjects posed at exact right angles to the cameras. The flashlight was placed in the room behind the sheet and just before the exposure the lights in all rooms were turned off. That is done to prevent any false or strange shadows forming while waiting for the flash to go off.

*The sketch used herewith is from "How to Make Good Pictures," published by the Eastman Kodak Company.

One must pay particular attention to avoiding reflections from walls, pictures, glass book cases, etc. The best doorway to use for your silhouette work is one near a corner of a room in which the wall paper is rather dark.

In developing silhouettes be sure to make the negatives extremely contrasty with great steps between the white of the ground and the black of the subject. If you develop a soft negative the sheet may print in somewhat and spoil the



DICK.

Figure 3.

effect. Use double or triple strength developer to be safe in getting enough contrast, and carry the development until the background blackens.

You will find that it will be necessary in many cases to mask the lower part of the silhouette. This may be done, as was the case in "Dick" and "Gretchen", with a paper mask, or as was the case in "Joan and Pat" with opaque. Any opaque will do, but the writer finds the Eastman Opaque runs freely and is easiest and best to use.

The pictures of "Dick" and "Gretchen" are printed on Regular Velox. This paper is contrasty enough to get the

best effect of the silhouette, and the writer recommends it. "Joan and Pat", printed on Hard X, or No. 4, Azo, another extremely contrasty paper, shows up excellently.

In closing let me caution the silhouette maker not to include too much in his picture. Single heads are simplest to make and are very effective, though for sale or other purposes, such as magazine competitions, two may be used.



Figure 4.
GRETCHEN

The flashlight should be about 4 feet to 6 feet from the sheet on one side, and the subject from two or three feet on the other, depending entirely on the size camera used, or how many heads are to be included, and what size space you have in which to work.

Silhouettes by photography are easy to make, pleasant to look upon, novel in effect and it is the writer's belief a mighty nice branch of photography, though little experimented with in late years.



LEO REX.

EUGENE P. HENRY.

COLOR IN THE NEGATIVE

By J. E. FOSS



OLOR in the negative is not as well known or used since the advent of the acid fixing bath, as the hardener containing both acid and sulphite would bleach out or remove most of the color.

The development of Aerial Photography during the war, brought the stained negative back into use, and by its use saved many otherwise hopelessly undertimed negatives.

Pyro, of course, is the reducer used for obtaining stained negatives.

Formulae.

A. Sodium Bisulphite	8	grams
Metol	7	"
Pyro	8	"
Pot. Bromide	3.5	"
Water to	500	c.c.
B. Sodium Carbonate	90	grams
Water to	500	c.c.
C. Sodium Sulphite	90	grams
Pot. Bromide	2	"
Water to	500	c.c.

For Use.

1. Staining Developer.

A	1	part
Water	3	parts
B	4	"

2. Non Stain.

A	1	part
C	1.5	parts
Water	4	"
B	4	"

As most of us know, the negative developed with pyro, will give an image having more or less yellowish color, according to the amount of sulphite used, the yellow color being due to an oxidation product of the pyrogalllic acid which is deposited



HOME DUTIES.

P. F. Squier.

along with the silver. It is possible to show this very clearly by removing (bleaching) the silver and leaving an image consisting of the yellow oxidation product only.

Prints can be made from negatives so treated, and this is a good way to treat microscopic negatives and slides wherein a fine grain is desired. Owing to the fact that printing papers are sensitive chiefly to blue light which is strongly absorbed by this yellowish color, a yellow negative appears much denser when printed than it does to the eye, and the yellowness can be measured by finding out how dense the negative is when printing as compared with its visual density.

Thus, if a negative of a given color proved on trial to be twice as dense as it appeared to the eye, we should say that it had a color index of 2. If we take a pyro developer containing five parts of pyro per thousand and ten parts of carbonate, and then vary the amount of sulphite from none to fifty parts per thousand, we find that the color index varies as follows:

Sulphite	Color Index
Parts per 1000	
50 " "	1.16
25 " "	1.24
15 " "	1.30
10 " "	1.45
5 " "	1.80
0 " "	2.75

From this table we see that when using fifty parts per thousand of sulphite a pyro negative will be gray, and will print almost as it appears to the eye. With fifteen parts it will be 30% stronger in printing than to the eye (a good color for portrait negatives 1.30 to 1.50) and when the sulphite is less than five parts per thousand the negative will print just as if there were two negatives, without the color, put together for printing, even a very thin negative with this strong color printing up well. The stain developer is the finest way I have ever found for obtaining snappy negatives from high speed exposures that are bound to be under-timed.

Local reduction may be done on the stained negative by using some one of the well known stain removers. Stained negatives should be fixed in a plain hypo bath, 35% being the best working strength.

ARCHITECTURAL PHOTOGRAPHY

By MARK W. STEVENS



IT would probably come as considerable of a surprise to the average commercial photographer, if he should read this, to know that the work he turns out of completed buildings is quite looked down upon by the better architects; however, they take it because they are unable to command the services of a regular architectural photographer.

In the photographing of a finished building the architect does not desire a print showing every stick and stone in the structure—usually quite flatly lighted, and with a minimum of shadow. What is wanted is a print giving the *effect* of the building as the average passer-by will see it. The form and texture must be preserved, and it must be attractively lighted. That is, there must be enough shadow present to throw into relief the cornice, mouldings, pillasters, and any carving which may be on the structure.

The architect studies his lighting in designing a building and proportions the depth of the carvings, pillasters, and mouldings, etc., to accord therewith. The depth of these features, and the amount of shadow which they cast, are not a matter of haphazard guess in the office of a good architect. And, above all things, the proper drawing of the building must be preserved. This matter of drawing is something which means nothing to the commercial photographer—all that he is anxious to do is to get all of the building on the plate.

In this work a lens of as long focus as possible should be employed. Then one will not turn out prints in which a long building looks as though the far end were half a mile away instead of only half a block. Anyone who has looked over architectural photographs will know just what I mean. We all know that the wider angle lens we use on a building the greater the effect of size of the front of the structure, and the smaller the rear portion looks in proportion to the front. Hence, the architect who demands good work, will appreciate much more thoroughly a print from negative made with a



Figure 1.

Illustrating article "Architectural Photography," by Mark W. Stevens.

comparatively long focus lens. Most of my work has been done with a $7\frac{1}{2}$ " lens on a 4 x 5 plate, and the resulting negative projected to an 8 x 10 print. The average "wide-angle" lens should be taboo except when the space will not permit the use of a narrow angle lens.

There are, of course, times and seasons when the wide-angle lens is the only one possible to use under the circumstances, and in this case its use is tolerated. Also, a fully corrected anastigmat is not always a necessity. In fact it is easier to preserve the "texture" of a building with a moderately "soft-focus" lens, such as the new Graf "Variable." I have also used a Wollensak "Verito" at F/6 with very pleasing results. The "Variable" is, however, a much easier lens to use; and as it is both a lens of variable softness and perfect anastigmat in one lens, it is a very desirable piece of equipment.

The old idea that it was necessary to lug around an 8x10, or larger camera, for this work is fast becoming a thing of the past. In fact, the man who is probably the best architectural photographer in this country carries nothing larger than a 5x7, and delivers projected prints of about 11x14" size. He says that there is no use in carrying a large equipment when the smaller one will give just as satisfactory results.

Prints No. 1 and No. 2 will illustrate what I mean by a good lighting. They were taken within a few minutes of each other, but one is very attractive, showing, as it does, the shadows of the recessed windows, buttresses, mouldings, etc. The other is a failure as an architectural photograph. It has fine massing, and most charming dominant verticals, suggesting strength and mass, but it fails on account of the flat lighting. About six-thirty in the evening is the correct time to make this picture, then the sun casts the shadow of a nearby tree on the surfaces, breaking it up into masses of light and shade—something that is really worth looking at.

The question of lighting is one that cannot be too carefully studied. In the main, no matter how carefully one has exposed, developed, and printed the result will be a failure, artistically, if the lighting is not good. It is well, whenever one has a bit of work of this nature, to pass the building a number of times at different hours of the day. In this way one will soon see at what hour the building will be the best



Figure 2.

Illustrating article "Architectural Photography," by Mark W. Stevens.

lighted, and so save trouble in lugging apparatus around on a fruitless errand. In general, buildings facing north will give the most trouble. May, June and July are about the only months in which these buildings are attractively lighted, and then only in the late afternoon. There have been one or two buildings for which I have waited nearly six months in order to get a thoroughly satisfactory lighting. Buildings facing south, east, or west are well lighted at some hour of the day on every bright day of the year.

And right here it might be well to say that for anyone taking up architectural photography, either as a hobby or with the intention of specializing in the work as a profession, there are a number of good works on architecture in every public library, and I would most heartily recommend the careful reading of at least some of them that one may familiarize oneself with what good architecture is. "House and Garden" and the "House Beautiful" magazines often have good illustrations of houses, both exterior and interior. These are worth studying as the photographs have been made by some of the best workers in this branch of the art.

If you have the opportunity to see the work of John Wallace Gillies of New York, make the most of it. This man, to my mind, is one of the best architectural photographers in the country today. He knows architecture, and he knows photography. He has a most delightful sense of values in light and shade, and the way he interprets textures in a building, or wall surface, is a joy. When one sees a photograph by him of a white building, there is no question as to whether it be marble, limestone, stucco, or wood, and yet not because of any insistent detail. He has preserved the texture, and this is something that all of us who aspire to do successful work must endeavor to do likewise.

As to apparatus and methods of working, each will have to use what he has, or can afford to buy. The camera need not be large, but must have draw enough to accommodate as long focus lenses as will be used; a swing back or a very large rise to the front-board (my 4 x 5 has better than 3" rise); and a reversible or revolving back. The subject of lenses has been treated in an earlier paragraph. As to sensitive material, use that with which you are most familiar. However, preference should be given to double-coated plates, or to such



Figure 3.

Illustrating article "Architectural Photography," by Mark W. Stevens.

film as Eastman's on account of the non-halation qualities. It should also possess good orthochromatic quality, as it will be often necessary to use filters to get satisfactory rendering of sunlight and shade. Development should be rather on the soft side, and for printing use your own judgment as to the brand of paper—but *do not* use glossy except the print be for reproduction. A good strong tripod is a necessity, and should be equipped with rubber tip when interior work on tile or marble floors is in hand. Full exposures should be the rule.

Print No. 3 is an example of difficult interior to handle. The east window, over the altar, being brightly lighted from the daylight outside, and the inside quite feebly lighted through the colored windows of the clerestory. The problem was solved, after many experiments with varying exposures, developers, and methods of development, in an effort to get detail in the woodwork, and at the same time preserve the east window. The final solution was to place an electrically fired flash-lamp behind the column and Bishop's Throne (at the right), and a corresponding flash-lamp at the left side of the Choir, opposite the first. These two lamps were fired simultaneously from the lighting circuit, just at the end of the daylight exposure on the window. A Wratten & Wainwright Panchromatic plate was used in conjunction with a "K-3" filter, the flash being large enough to allow for the depth of the filter.

Architectural photography is a large subject, and in this short article I have been able to touch only a few of the high spots. As a hobby it is fascinating and as a profession promises well. A man who has made a study of architecture and photography, and is able to turn out the work that will satisfy the discriminating architect, or owner, will be able to command excellent prices for his work—prices far above what the average commercial photographer will charge—and which said architect, or owner, will cheerfully pay.



CAROLINE.

LEONID FINK.

CARBON AND CARBRO

By A. C. BRAHAM, F.R.P.S.



HAT'S in a name? Why Carbon? Names are frequently of interest as indicating the original properties or origins of things and of processes.

Calico no longer comes to us from Calicut and muslin is not generally imported from Moussul. Carbon does not directly indicate the nature of a photographic process, but is only a negative description signifying that the print is not due to a silver compound.

Pigment printing or "Photography in Pigments" to quote the title of an early book on the subject, is a name which describes and does not hide the original conception and is, I think, preferable to the generally used term "Carbon."

Carbro is a trade name which is unusually explanatory of the nature of the print to be made *Carbon* from *bromide*.

Carbon, to use the popular description, is a process that merits and commands the attention of every photographic worker who desires to attain beauty and permanence of results, as well as utility in his or her productions.

It provides a means of artistic expression not to be rivalled by any other process, and therefore appeals most strongly to all those who desire the means of rendering their ideas in the most varied, artistic, and individual manner.

Various shades or hues of black, brown, red, blue and green, provide a range of some forty colors that are purchasable and a number of transfer papers differing in tone, in texture, in surface, and in substance equally numerous, so that there is practically no limit to the varied results that can be produced by the conjunction of appropriate tissue and transfer, and bizarre or eccentric effects are available as by developing black pigments on gold surface paper, blue or green on silver surface.

Precise instructions should be sought in the lists or pamphlets issued by the manufacturers. Briefly the method of work is that pigmented paper is sensitized by immersion in a solution of bichromate of potash, dried and then exposed under a

negative to the action of light which insolubilizes the pigmented gelatine proportionately to the densities of the negative.

The printed pigmented paper is squeegeed on to the transfer paper chosen and then developed by immersion in hot water, which washes away all those soluble parts not needed to form the picture.

The process is simple, but drying the tissue under favorable conditions and correctly estimating the exposure needed provide possible pitfalls for the beginner, which experience readily avoids. These facts, however, prompt a number of admirers of Carbon to prefer the Carbro process which yields prints identical with those produced by Carbon printing, the same pigmented and transfer papers being used.

The method differs in that the Carbro is produced, not by the action of light, but by a chemical change which is induced by contact between a bromide print or enlargement, and a piece of pigmented paper that has been saturated with a bleaching solution containing bichromate, bromide and ferricyanide of potassium.

A chemical change takes place with the result that the bromide print is bleached, and at the same time the gelatine of the pigmented paper is rendered insoluble proportionately to the density of the deposit of silver in the bromide print.

The pigmented paper remains in the above solution for three minutes, and then after a few seconds draining is immersed in a second bath containing formaldehyde and acetic and hydrochloric acid for an average time of twenty seconds. It is then squeegeed on to the bromide print and remains in contact for fifteen minutes.

Pigmented paper and bromide are then separated and the former squeegeed on to the transfer paper it is intended to use and placed between blotting boards for half an hour, then developed in the manner usual with Carbon prints.

The bromide, after washing in running water, should be re-developed, and is then ready for use for making further impressions.

The whole process is entirely independent of dark-rooms or of light action, and so can be worked at any time in any available room.

NIGHT PHOTOGRAPHY

By A. W. DREYER



LITTLE known side of photography is the making of pictures at night. To the uninitiated it will seem strange and bizarre that photographs can be made out doors after dark without the aid of flashlight. Repeatedly have passersby stopped and asked questions as to the reason and technique of making pictures at night. Most of them have extremely amusing questions to ask.

Once you have become acquainted with the beauty of night photography, daylight work will appear tame and commonplace besides. I do not know a pleasure more appealing than the making of outdoor pictures at night. It is with a certain fascination that I go out to woo the beauty of night, and the pleasure on beholding the finished print is worth all the effort and trouble gone to.

Almost any camera or lens will do. I prefer a 5 x 7 view camera, it is a bit heavy, but it gives results. Your Brownie will do. However, an exposure that will require thirty minutes with same, can be made in three minutes with an extra fast lens. As you will readily see the working aperture of the lens is a very serious item in night work. Do not be discouraged if your lens is not a fast one. If you are able to make good pictures by day, you will be able to do equally well at night, if you but persevere.

A single lens, the ordinary meniscus on the cheapest camera, gives the most brilliant picture when working against a bright light, because it is free from all internal reflections from which the doublet can not escape. The rapid rectilinear, as well as the high priced anastigmat, has at least one reflecting surface, and sometimes a greater number, from which a half or large circle is formed, when an exposed light is included in the picture. A sort of a "sun dog" as it were. This can very often be avoided by shifting the camera to right or left so that the troublesome reflection will be cast upon the walls of the bellows, and not upon the sensitive film.

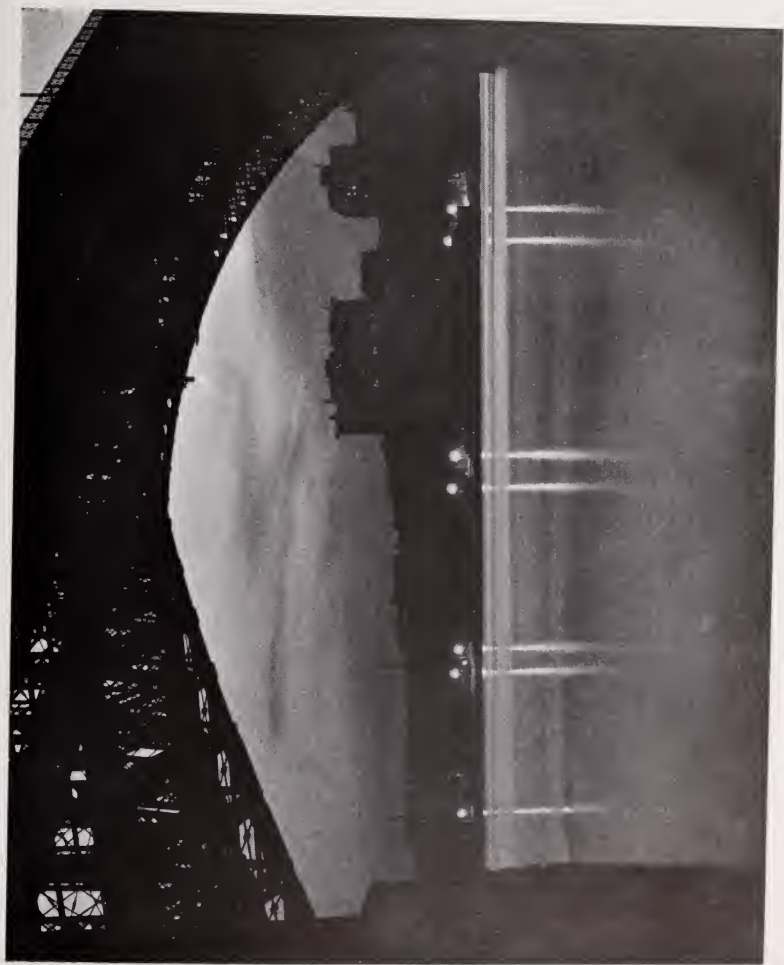


Figure 1.

LIGHTS ALONG THE RIVER.

Illustrating article "Night Photography," by A. W. Dreyer.

The really big problem of night photography is to know what not to take. The beginner is apt to waste a lot of time and material photographing electric signs, and other subjects, equally as inartistic. It seems to be *the cave man period* of night work, and in most cases must be gone through with, and the sooner the better. You will then very likely discover that there is an unexplored field before you for real artistic expression.

In night photography you have not a lot of detail as in daylight pictures, which obtrudes itself upon the eye, to the detriment of real artistic effect. You have instead a mass of darkness balanced by one or more highlights, the judicious placing of which will give you a result that is surprisingly beautiful. Provide yourself with an electric flashlight although not absolutely necessary. You will find it a great convenience. Make your exposures by capping and uncapping the lens, as you may be in doubt as to whether the shutters are *set* or not. By using a cap, you are positive as to what you are doing. By all means have the cap loose fitting so that you will not jar the camera, when putting it on and off. It may be necessary to cap the lens while you are requesting some auto driver to park his machine some other place, and not directly in the foreground of your picture. Always shade the lens from moving lights, as otherwise they will leave a streak upon the print. This includes street cars and automobiles and other bright lights. Do not cap lens when shading for a moment only. Simply hold plate-holder slide, or your hat, in front of lens, but do not touch the camera. By so doing you might move the camera, and the result will be a picture with a double outline.

Do not attempt exposures in windy weather as you will surely fail. Unless you have a box camera, and place same on something solid with a heavy object on top of it, you will not be able to get clear and sharp pictures. Vibration is the bane of night work, and must be carefully guarded against.

The writer uses portrait cut film exclusively. They are so very superior to plates for this kind of work. After a thorough trial of both you will never think of using anything else. Roll film is very good if you have this kind of camera, but for all who use a view camera, cut film is the best. You may use your ordinary plate holder to hold cut film by simply pro-



Figure 2.
ENTRANCE TO APARTMENT HOUSE. F6/8; time 10 minutes.
Illustrating article "Night Photography," by A. W. Dreyer.

viding yourself with a film sheath especially made for this purpose. Failing this, take a piece of cardboard a trifle thinner than a dry plate, the exact size of your film, then with a few short pieces of lantern slide binding strip attach same to cardboard a few inches here and there.

I have repeatedly used this method with good results. On the small sizes it is not necessary to do this, just slip in loosely with cardboard, and the trick is done. Use black paper, which separates the film in the package, underneath film in plate holder, as this will greatly help to prevent halation.

To develop, use any standard developer dilute with three times usual quantity of water, and let film soak. Needless to say, development must be prolonged accordingly. In warm weather be sure to keep temperature of all solutions below 75 degrees. Otherwise the long soaking with high temperature will ruin film. I use Pyro, and find the same gives best results.

Developing paper is not suitable for the printing medium; it is entirely too harsh. A negative of a night subject is, to say the least, extremely contrasty, and there is nothing for contact printing equal to the ordinary silver print-out paper. It gives you more than you believed that your negative possessed. It gives you transparent shadows, and the delicate shimmer of the moonlight upon the water will be faithfully recorded. By all means enlarge your pictures, as this brings out their beauty wonderfully, but upon some soft working paper. The advanced worker will do well to make an enlarged negative and reproduce in carbon or gum. Figure 2 accompanying this article has complete data on exposure, and will serve as a guide.



PATCHEN PLACE AT NIGHT.

SOPHIE L. LAUFFER.

American Annual Formulary

In the following section we have gathered together a typical collection of Formulae and Tables, which will assist the photographer in his every-day work. It will be noticed that makers' formulae are omitted. These can best be obtained by direct application to the makers. The appended formulae are selected from the working methods of practical photographers.—Editor.

TRAY DEVELOPERS FOR PLATES AND PAPERS

Amidol. (W. M. Keck).—Amidol, 20 grains; sodium bisulphite (dry), 40 grains; sodium sulphite (dry), 60 grains; potassium bromide (powdered), 1 to 3 grains; water, 4 ounces. For all kinds of developing paper. Expose so that the development will be complete in twenty to thirty seconds. The tone is a blue black.

Amidol Universal Developer. (W. A. Alcock).—Water, 20 ounces; sulphite of soda (dry), $\frac{3}{4}$ ounce; Amidol, 50 grains; potassium bromide, 10 grains; citric acid, 20 to 40 grains. Splendid developer for papers intended for bromoil. Expose so that the image first shows in thirty seconds and develop for four minutes. Gives good tones in hot or cold hypo alum, and nice soft negatives. Splendid in hot weather as minimizes danger of frilling owing to lack of carbonate.

Diamidophenol. For Paper (Edwin Loker).—Water, 20 ounces; sodium sulphite (anhydrous), $1\frac{1}{2}$ ounces; sodium bisulphite, 10 drams; bromide potassium, 10 grains. To use, take 2 ounces and add 6 grains diamidophenol.

Ferrous Oxalate. For Papers (M. G. Lovelace).—No. 1. Hot water, 1000 CC. Dissolve ferrous sulphate, 250 grams; add slowly sulphuric acid, 3 CC. No. 2. Potassium oxalate (neutral), 250 grams; potassium bromide, 1 gram; hot water to make 1000 CC. Add 1 part of No. 1 to 4 parts of No. 2. After development wash in acetic acid stop bath.

Hydroquinone. (Max Gartner).—Solution No. 1. Water, distilled, 20 ounces; hydroquinone, 160 grains; sodium sulphite (anhydrous), 2 ounces citric acid, 60 grains; potassium bromide, 40 grains. Solution No. 2, water, distilled, 20 ounces; caustic soda (sticks), 160 grains. For use take No. 1 one part, No. 2 one part, and water two parts.

Hydrochinon.—For over-exposure plates to obtain contrasty negatives (B. H. Allbee).—No. 1, water, 8 ounces; sulphite of soda (anhydrous), $\frac{1}{2}$ ounce; hydrochinon, 80 grains. No. 2, water, 8 ounces; carbonate of soda (dry), 1 ounce; potassium bromide, 40 grains. Take equal parts of No. 1 and No. 2. Temperature, 70 degrees.

Metol (H. W. Hales).—Metol, 60 grains; warm water, 16 ounces; sulphite of soda (anhydrous), $\frac{1}{2}$ ounce; carbonate of soda (dry), $\frac{1}{2}$ ounce. Dissolve metol in warm water, then add the sulphite and carbonate in order named. Cool. Can be used repeatedly. For developing papers add a few drops of 10 per cent. solution of bromide of potassium.

Metol-Hydroquinone for Orthochromatic Plates.—Water, 20 ounces; metol, 14 grains; potassium metabisulphite, 18 grains; hydroquinone, 56 grains; sulphide of soda (anhydrous), 1 ounce; carbonate of soda (dry), $1\frac{3}{4}$ ounces. Use 1 drop of a 10 per cent. potassium bromide solution to each ounce only if necessary.

Metol-Hydroquinone. For Paper (M. Gartner).—Water, distilled 3-ounces; metol, 15 grains, sulphite of soda (anhydrous) 1 ounce; hydroquinone, 60 grains; sodium carbonate (dry) 6 drams (for contrast use 1 ounce); bromide of potassium, 5 grains. Dilute this stock solution with an equal amount of water.

Developer for Commercial Work. (Max Gartner).—Water, distilled, 100 ounces; Ortol, $\frac{1}{2}$ ounce; hydroquinone, 2 ounces; sulphite of soda; anhydrous, 8 ounces; carbonate of soda, anhydrous, 12 ounces; bromide of potassium, $\frac{1}{4}$ ounce. For plates use full strength.

Para-Amidophenol. (M. G. Lovelace).—Dissolve 150 grains sulphite soda (anhydrous) in 800 CC. hot water; add 20 grains para-amidophenol; dissolve 8 grains lithium hydrate in 100 CC. water, and add until precipitate formed is dissolved; then add water to make 1000 CC.

Pyro. For Prints (M. G. Lovelace).—No. 1 Pyro, 12 grains; sulphite soda (anhydrous), 80 grams; potassium ferrocyanide, 2 grams; water, 500 CC. No. 2 Sodium hydrate, 4 grams; water, 500 CC. To use, one part each with water 2 parts. Add 3 drops saturated solution bromide of potassium to every 400 CC. of developer.

Pyro. For Night Subjects (Robert Dykes).—Stock solution—Pyro, 1 ounce; potassium bromide, 60 grains; potassium meta-bisulphite, 50 grains; distilled water to make 12 ounces. No. 1. Take stock solution 3 ounces, add 2 ounces boiled water. No. 2. Sulphite soda (anhydrous), 1 ounce; carbonate soda (dry), 1 ounce; water (boiled) to make 20 ounces. For use, 4 dram No. 1 to 5 drams No. 2 in 16 ounces of water.

Pyro. For Overtimed Plates (J. D. Elliott).—Sulphite soda, 40° solution, 4 ounces; water, 4 ounces; pyro, 10 grains. Immerse plates in this solution for 20 minutes in the dark; then add to above solution $\frac{1}{2}$ dram carbonate soda, 20° solution. When image appears add one more dram of the carbonate soda solution.

Pyro. (W. M. Keck).—Pyro, 20 grains; sodium carbonate (dry), 40 grains; sodium sulphite (dry), 60 grains; water, 16 ounces. For either tray or tank development. Time six minutes.

Pyro Tray Film Developer. (J. E. Carson).—No. 1 solution, boiled water or rain water, 8 ounces or 240 C.C.s.; potassium metabisulphite, 60 grains or 3.55 grams; pyro, 120 grains, or 7.10 grams. No. 2 stock solution; boiled or rain water, 8 ounces, or 240 C.C.s.; sulphite soda anhydrous, 328 grains, or 21 $\frac{1}{2}$ grams; carbonate soda, 219 grains, or 14 $\frac{1}{4}$ grams. For developing use half ounce or 15 cubic centimeters of each solution, and four ounces or 120 C.C.s water. Develop for five minutes at 65 degrees.

Pyro-Metol. For plates (H. M. Long).—A. Water, 22 $\frac{1}{2}$ ounces; metabisulphite, 2 drams; metol, 60 grains; pyro, 1 ounce. B. Water, 16 ounces; sulphite soda (anhydrous), 2 ounces. C. Water, 16 ounces; carbonate soda (dry), 1 ounce. Normally used 1 ounce of each stock to 16 of water.

TANK DEVELOPERS FOR NEGATIVES

Metol-Hydro (Frew).—Water, 12 ounces; metol, 7 $\frac{1}{2}$ grains; sulphite soda (anhydrous), 274 grains; hydroquinone, 30 grains; carbonate soda (anhydrous), 150 grains; bromide potassium, 2 grains. For use to each ounce of above add 4 ounces of water; temperature, 65 degrees; time, 12 minutes.

Monomet-Hydro-Pyro (John Boyd).—Monomet, 4 grains; hydroquinone, 4 grains; pyro, 4 grains; metabisulphite potassium, 4 grains; carbonate of soda, dessicated, 40 grains; sulphite of soda (anhydrous), 60 grains; bromide of potassium, 1 grain; water, 4 ounces. For tank development use 28 ounces of water. Development 20 minutes at 65 degrees.

Pyro (George D. Jopson).—No. 1. Water, 16 ounces; meta-bisulphite of potash, 70 grains; pyro, 1 ounce; bromide potassium, 8 grains. Mix in order given. No. 2. Sulphite soda, 60° test. No. 3. Carbonate soda, 40° test. To use, mix 2½ ounces of No. 1, 2 and 3 in rotation, add 57 ounces of water. Develop 20 minutes at 65°.

Rodinal or Activol.—Water, 60 ounces; rodinal or activol, 1 ounce; temperature, 65 degrees; time, 25 minutes.

DEVELOPERS FOR LANTERN SLIDES

Hydroquinone (B. H. Allbee).—No. 1. Hydroquinone, 150 grains; metabisulphite potash, 10 grains; bromide potassium, 50 grains; water, 20 ounces. No. 2. Sulphite of soda (anhydrous), 1 ounce; caustic soda, 100 grains; water, 20 ounces. Take equal parts of No. 1 and No. 2.

Hydroquinone. One Solution for Warm Tones (A. H. Farrow). Hydroquinone, 1 dram; sulphite of soda (anhydrous), 2 drams; carbonate of soda (dry), 4 drams; bromide of potassium, 20 grains; water, 12 ounces.

Hydroquinone. For Colder Tones (B. H. Allbee).—No. 1. Hydroquinone, 60 grains; sulphite of soda (anhydrous), 1 ounce; citric acid, 10 grains; bromide potassium, 10 grains; water, 10 ounces. No. 2. Carbonate of soda (dry), 1 ounce; water, 10 ounces. Use equal parts.

FIXING BATHS AND HARDENERS

Fixing and Hardening Bath. For Plates, Films and Papers. (W. A. Alcock).—In hot weather, hypo, 1 lb.; epsom salts, 1 lb.; water, 100 oz. In cold weather, hypo, 1 lb.; epsom salts, ½ lb.; water, 100 oz.

Acid Fixing Bath (Carbutt).—Sulphuric acid, 1 dram; sodium hyposulphite, 16 ounces; sulphite of soda (anhydrous), 2 ounces; chrome alum, 1 ounce; warm water, 64 ounces. To prepare the bath, dissolve the hypo in 48 ounces of water, the sulphite of soda in 6 ounces; mix the sulphuric acid with 2 ounces of the water and pour slowly into the sulphite solution and then add to the hypo solution. Dissolve the chrome alum in 8 ounces of water; add to the bulk of the solution and the bath is ready for use.

Fixing Bath for Lantern Slides (B. H. Allbee).—Sulphuric acid, 1 dram; hypo, 16 ounces; sulphite of soda (anhydrous), 1 ounce; chrome alum, 1 ounce; water, 64 ounces.

Plain Fixing Bath.—Dissolve 1 pound of sodium hyposulphite in 2 quarts of water, or 4 ounces of the hypo in a pint of water, according to the bulk of the solution required.

Hardener for Fixing Bath (Beach).—Water, 40 ounces; sulphite of soda (anhydrous), 3 ounces; powdered alum, 16 ounces; acetic acid, 40 ounces. Add in the order given and shake well until dissolved. Of the above add 16 ounces to each gallon of hyposulphite of soda solution, testing 70 to 80 degrees.

Hardening Negatives.—Immerse them for a few minutes in formalin, 1 ounce; water, 30 ounces.

Short Stop, removes developer stains; renders an acid fixing bath unnecessary when making D. O. P. or bromide prints, and destroys stains on both prints and fingers. (J. E. Carson).—Potassium metabisulphite, 1 ounce or 30 C.C.s.; water, 32 ounces, or 960 C.C.s. When thoroughly dissolved add 10 drops C. P. sulphuric Acid. This bath should have a light sulphur dioxide odor after standing awhile. If not, add acid drop by drop until odor appears.

INTENSIFICATION

Intensifier, One Solution (F. M. Steadman).—No. 1. Bichloride of mercury, ½ ounce; water, 10 ounces. No. 2. Iodide of potassium,

5 drams; water, $1\frac{1}{2}$ ounces. Add to No. 1. No. 3. Hyposulphite of soda, 1 ounce; water, $2\frac{1}{2}$ ounces. Add to the previous mixture. This clears the solution when it is ready for use for local intensification. For tray intensification add more water to slow its action.

Intensifying with Red Ink (E. M. Cohen).—Soak the negative well. Put teaspoon of red ink into tray of water and rock until mixed. Immerse negatives face up till well and evenly colored, then without washing put in drying frame. If left in solution too long will be over dense, in which case several trays of clear water will eliminate some of the color.

The intensification is permanent without the danger of negative going bad, as is the case when mercury is used.

Intensifier—Mercuric Chloride Process.—No. 1. Mercuric chloride, 200 grains; bromide of potassium, 120 grains; water, $6\frac{1}{2}$ ounces. No. 2. Sulphite of soda (anhydrous), 1 ounce; water, 4 ounces. The well-washed negative, free from hypo, must be thoroughly bleached in No. 1; well washed; and then blackened in No. 2. After blackening it is well washed again.

REDUCTION

Reducer, Single Solution (F. M. Steadman).—Red prussiate of potash, size of pea; hyposulphite of soda, six times that volume; water, 6 ounces (for local reduction, $1\frac{1}{2}$ ounces.) When reduced wash thoroughly.

Reducer—Ammonium Persulphate.—Ammonium persulphate, 15 grains; water, 1 ounce. The solution should be made just before use. The negative must be perfectly free from hypo or it will be stained by the persulphate. When the desired reduction has been reached, transfer the negative without washing to a 10 per cent. solution of anhydrous sodium sulphite. Wash finally for 15 or 20 minutes.

Reducer—Farmer's.—Dissolve 1 ounce of potassium ferricyanide in 9 ounces of water and make up to 10 ounces, forming a 10 per cent. solution. Label this poison. Thoroughly wet the negative to be reduced. Take enough fresh plain hypo fixing bath for the purpose, and add to it enough of the ferricyanide solution to make it a light straw color. The negative to be reduced is immersed in this solution, when it will be seen to lose density. Rock the tray to insure evenness of action. This reducer can also be used for local treatment.

PRINTING PROCESSES

Blue Prints

Blue Printing Sensitizing Formulæ (Brown).—A. Dissolve 110 grains ferric ammonium citrate (green) in 1 ounce of water. B. Dissolve 40 grains of potassium ferricyanide in 1 ounce of water. These two solutions are made up separately. They are then mixed together and kept in a stoneware bottle, but the single solution should always be filtered before use. The mixture will retain its good qualities for months if kept from the light.

(Millen).—Potassium ferricyanide, 1 ounce; ammonio-citrate of iron, $1\frac{1}{2}$ ounces; distilled water, 10 ounces. Mix thoroughly and filter. The solution should have a deep wine color and dry on the paper a lemon-yellow. If the solution is green and has a precipitate, the ammonio-citrate is old and spoiled. The mixture should be kept from the light.

Bromide Paper

Bromide Paper Developers: Hydroquinone-metol. No. 1. Water, 10 ounces; hydroquinone, 52 grains; potassium metabisulphite, 18 grains; sulphite of soda (anhydrous), 5 drams; carbonate of soda,

1¼ ounces. No. 2. Water, 10 ounces; metol, 30 grains; carbonate of soda, 5 drams; sulphite of soda (anhydrous), 5 drams. One or two drops of a potassium bromide 10 per cent. solution added to 1 ounce of the mixed developer will increase contrast and keep the whites pure. Equal parts of 1 and 2 give excellent prints from a normal negative; one part of 1 and two of 2 give gray prints with maximum half-tone and gradation; two parts of 1 and one of 2 give vigorous prints from soft delicate negatives.

Amidol for rich blacks (freshly prepared). Distilled (or boiled) water, 4 ounces; sulphite of soda (anhydrous), 45 grains; amidol, 10 to 15 grains. Add a drop of 10 per cent. bromide solution to each ounce of developer.

Sepia Tones: Hypo Alum.—Hyposulphite of soda, 5 ounces; ground alum, 1 ounce; boiling water, 70 ounces. Dissolve the hypo in the water, and then add the alum slowly. A milk-white solution results which should be decanted when clear. It is not used until cold (about 60° Fahr.).

Sepia Tones: Sulphide of Sodium.—The fixed and washed print is treated with one of the following solutions: (1) Potassium ferricyanide, 10 grains; potassium bromide, 10 grains; water, 1 ounce; or (2) potassium ferricyanide, 20 grains; sodium chloride (common salt), 30 grains; water, 1 ounce. The image will be bleached by either of these solutions in a few minutes, the whitish appearance of the deposit being caused by its change into a salt of silver. After 5 minutes in running water apply the sulphuretting solution: Dissolve 3 ounces of sodium monosulphide in 15 ounces of water; boil the solution for about 10 minutes, filter off the black precipitate formed, and when cooled make up to 25 ounces with water. To tone take of the sulphide solution 1 ounce and add water 12 to 20 ounces.

Red Tones: Copper.—Dissolve 100 grains of ammonium carbonate in 2 ounces of water, and in this solution dissolve 10 grains of sulphate of copper. Then add 20 grains of potassium ferricyanide. A clear, dark green solution results which gives a red-chalk tone in about 3 minutes. Tone until the deepest shadow is converted, and then wash the print for 10 minutes.

Green Tones: Vanadium.—Bleach print in the following: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce. Wash well and apply: Ferric chloride, 2 grains; vanadium chloride, 2 grains; ammonium chloride, 4 grains; hydrochloric acid, 5 minims; water, 1 ounce.

Blue Tones: Iron.—Bleach print in: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce; then tone in ferric chloride, 5 grains; hydrochloric acid, 5 minims; water, 1 ounce.

To prevent blistering on bromide paper (P. L. Anderson).—Immerse after fixing and before washing from 10 to 15 minutes in water, 10 ounces; formaldehyde, 1 ounce. A 10 per cent. solution of chrome alum will do equally well.

To make bromide paper translucent (P. L. Anderson).—Lay the paper negative face down on a blotter and paint thinly with the following mixture. Give three coats. Turpentine, 3 ounces; powdered resin, 1 ounce; gum elemi, 1 ounce; paraffine wax, ½ ounce. Heat with stirring until it begins to boil. Allow to cool slightly and add turpentine, 3 ounces.

Carbon Tissue

Carbon Tissue, Sensitizer for (Bennett).—Potassium bichromate, 4 drams; citric acid, 1 dram; strong ammonia water, about 3 drams; water, 25 ounces; dissolve the bichromate and citric acid in hot water, and add sufficient ammonia to change the orange color of the solution to lemon-yellow. Sensitize for 90 seconds; reducing the water softens

the gradation in the print; increasing it to 30 ounces gives more vigor.

Carbon Lantern Slides.—Prepare the glass by coating with the following preparation: 180 grains of Nelson's Gelatine No. 1, in 20 ounces water. Add 10 grains bichromate of potash. Dry and allow the plate to be exposed to light for a couple of days to make the coating thoroughly insoluble. Sensitizer for tissue: 1 per cent. to $1\frac{1}{4}$ per cent. solution of bichromate of potash. Immerse 2 minutes. Print deeply; expose twice as long as ordinary paper print. Develop in hot water as usual.

Gum Bichromate

Gum Bichromate (Casper Millar). A.—Gum arabic, $1\frac{1}{4}$ ounces; water, $3\frac{1}{2}$ ounces; salicylic acid, 4 grains.

B.—Chrome alum, 45 grains; water, $3\frac{1}{2}$ ounces. Grind A and B with water and pigment, brush over paper, dry and store.

Suggested formula.—A. 2 ounces; B, $1\frac{1}{2}$ drams; carbon black, 10 grains; sensitize for 2 minutes in 5 per cent. bichromate solution.

Kallitype

Kallitype Sensitizer for Black Tones (J. Thomson).—Distilled water, 1 ounce; ferric oxalate (Merck's or Mallinckrodt's), 15 grains; citrate of iron and ammonia (brown scales), 25 grains; chloride of copper, 8 grains; oxalate of potassium, 35 grains; oxalic acid, 15 grains; silver nitrate, 15 grains; gum arabic, 10 grains. For greater contrast add 1 to 10 drops 5 per cent. bichromate of potassium solution.

Developer: Stock Solution.—Distilled water, 1 ounce; silver nitrate, 40 grains; citric acid, 10 grains; oxalic acid, 10 grains. Filter. Normal developer 1 dram stock solution and 7 drams of water.

Platinum Papers

Platinum Sensitizer (P. L. Anderson).—Stock solutions: I. Water, hot, distilled, 2 ounces; ferric oxalate, 240 grains; oxalic acid, 16 grains. II. Water, hot, distilled, 2 ounces; ferric oxalate, 240 grains; oxalic acid, 16 grains; potassium chlorate, 4 grains. III. Water, distilled, 19 drams; potassium chloroplatinite, 219 grains ($=\frac{1}{2}$ ounce). Keep in amber glass bottles or in the dark. For use take: I, 22 mm.; II, 0 mm.; III, 24 mm. Gives very soft prints. Or, I, 12 mm.; II, 10 mm.; III, 24 mm. Results about the same contrast as a P. O. P. print. Or, I, 0 mm.; II, 22 mm.; III, 24 mm. Gives extreme contrast.

Above quantities sufficient for a 10 x 12 sheet of ordinary paper. Very smooth requires less and very rough more, up to 25 per cent. additional. Apply with a soft fitch or camel-hair brush, allow to surface dry, and make bone-dry over a stove or gas jet. Should dry in not less than five or more than ten minutes.

Platinum: Sensitizing Gold Bath and Sepia Papers. A.—Chloroplatinite of potassium, 15 grains; distilled water, 90 minims.

B.—Ferric oxalate, 21 grains; oxalic acid, 2 grains; distilled water, 183 minims. For cold bath paper, mix A and B, and add 15 minims of water. For sepia paper mix A and B and add 15 minims of a 5 per cent. solution of mercuric chloride. The addition of a few grains of potassium chlorate to any of the above gives increased contrast in the print. From 140 to 170 minims of solution are sufficient to coat a sheet of paper 20 x 26 inches.

Platinum Prints: to Intensify. A.—Sodium formate, 45 grains; water, 1 ounce.

B.—Platinum perchloride, 10 grains; water, 1 ounce.

C.—For use, take 15 minims each of A and B to 2 ounces of water. Immerse prints until sufficiently intensified, then remove and wash.

Platinum Prints to Distinguish from Bromide.—Soak the print in saturated solution of mercuric chloride; a platinum print will not change; a bromide print will bleach.

Salted Papers

Salted Paper Prints: Sensitized with the following: Silver, 480 grains Troy; water, 11 ounces. Dissolve and pour off 2 ounces, and to the 9 ounces left add strong aqua ammonia to form a precipitate and redissolve the precipitate, then add the remaining 2 ounces which will form another precipitate; to this add 9 drops of nitric acid C. P. Apply this to the paper with a tuft of cotton.

Any good toning bath will give good results, such as—Chloride aluminum, 80 grains; bi-carbonate soda, 360 grains; water, 48 ounces. When mixed this will form a flaky hydrate which will settle to the bottom. It can be strained through clean washed muslin. To prepare a small bath for toning, take 12 ounces of the stock solution and add sufficient gold to tone in 8 to 10 minutes. The gold solution must be neutralized with bi-carbonate soda before adding to the above bath. When the prints reach the desired tone throw them into a bath of salt water, made of water, 1 gallon; table salt, 1 ounce.

Printing Out Papers

Gold Toning (B. H. Allbee).—No. 1, 10 per cent. solution sulphocyanide of potassium; No. 2, 15 grains chloride of gold in 7½ ounces of water; No. 3, 10 per cent. solution phosphate of soda; No. 4, saturated solution borax. Take No. 1, 1 dram, water, 8 drams; No. 2, 4 drams; No. 3, 1 dram; No. 4, 2 drams. In this put print in dry. Toning should be complete in two minutes. Wash as usual.

Gold Toning.—For blue-black tones, for slight strengthening, and for converting rusty black into pure black. Soak prints in warm water, lay on warm glass, brush over glycerine and blot off. Pour on few minims of solution of gold chloride (1 grain per dram), and rapidly brush in all directions. When toned, rinse, and sponge back and front with: Metol, 50 grains; sodium sulphite, 1 ounce; potassium carbonate, ½ ounce; water, 20 ounces. Tone in daylight. Do not tone sepias or old prints in this solution.

Gold Toning—To Give Black Tones (A. B. Klugh).—Solution A. Sodium thiosulphate (hypo), 40 grams; water, 100 cc. Solution B. Lead nitrate, 5 grams; acetic acid, glacial, 5 cc.; water, 50 cc. Add to solution A enough of B to produce a slight milkiness. Filter and add 25 cc. of a 1% solution of gold chloride. Print deeply and tone until a warm black is produced.

MISCELLANÆ

Adhesive for Labels.—Soak 1 part of the best glue in water until thoroughly swollen, add a little sugar candy, 1 part of gum arabic and 6 parts of water. Boil with constant stirring over a spirit lamp until the whole gets thin. Coat sheets of paper with it; let dry and cut up into convenient sizes.

Autochromes.—Sensitizing to get more speed (M. G. Lovelace).—In complete darkness bathe plates in the following solution: Distilled water, 66 cc.; ethyl alcohol, pure, 90 deg., 33 cc.; dye solution, 2 cc.; ammonia, .30 cc. The dye solution is a mixture of pinachrome, pina verdol and pinacyanol, 1 part of each in 1000 of alcohol. Bathe plates for five minutes and dry away from dust. These plates require a special filter the formula being: Hard gelatine, 3 gms.; distilled water, 100 cc.; filter yellow K, 1 per cent. solution, 2.5 cc. Use 1 cc. to each 10 square centimeters of surface. These plates have about five times the speed and it is possible to make snap shots with them if a lens working at F/4.5 and F/5.6 is used.

Blackening Mixture.—Dissolve a 4-ounce stick of licorice in 8 ounces of water with the aid of gentle heat. When dissolved rub into the mixture 1 ounce of burnt sienna in powder, using the back of a spoon for this purpose. When cold, bottle for use.

Blackening Brass.—Make two solutions: Copper nitrate, 200 grains;

water, 1 ounce. Silver nitrate, 200 grains; water, 1 ounce. Mix the solutions; clean the article well; dip it in the solution for a moment; withdraw it; dry it; and heat it strongly.

Black, Dead, for Wood.—Shellac, 40 parts; borax, 20 parts; glycerine, 20 parts; water, 500 parts. When dissolved, add 50 parts aniline black.

Cleaning Greasy Bottles.—Wash with benzine, or permanganate of potassium, to which has been added some hydrochloric acid.

Bottles that have contained resinous substances, wash with potash or soda and rinse with alcohol. Bottles that have contained essences, wash with sulphuric acid, then with water.

Clearing Stained Negatives.—Dissolve $\frac{1}{8}$ ounce of pulverized alum in 20 ounces of water and add 1 dram of sulphuric acid. Immerse the stained plate in this solution for a few minutes; remove plate, wash and then set in the rack to dry.

Film: to Remove from Glass: Make two solutions. A.—Sodium fluoride, 6 grains; water, 4 ounces.

B.—Sulphuric acid, 6 drops; water, 1 ounce. Place the negative in solution A for 2 minutes and then place directly in solution B. After another 2 minutes lift the film with the finger from one corner of the plate. It will soon leave the glass.

Firelight Effects on Developing Paper (H. S. Hood). No. 1.—Water, 5 drams; copper sulphate, 10 per cent. solution, 15 minims; ammonium carbonate, 10 per cent. solution. Add till precipitate first formed is re-dissolved.

No. 2.—Water, $4\frac{1}{2}$ ounces; potassium ferricyanide, $\frac{6}{10}$ drams. Mix separately and add No. 2 to No. 1. The print will turn bright red. Wash well.

Ground Glass: Substitutes for. 1.—Paraffine wax makes an excellent substitute for ground glass if the latter should get broken. Iron the paper onto a sheet of plain glass. It is more transparent than the focusing screen and the image will appear clearer; hence, in exposing allowance must be made for the difference in illumination.

2.—Resin dissolved in wood alcohol and blown over the glass; this must not be scratched; it gives a very fine-grained ground glass effect.

3.—White wax, 120 grains; ether, 1 ounce.

Ground Glass Varnish: Sandarac, 90 grains; mastic, 20 grains; ether, 2 ounces. Dissolve the resins in the ether and add benzole $\frac{1}{2}$ to $1\frac{1}{2}$ ounces.

Lens: to Clean.—The lens should always be kept free from dust or other impurities. To clean it, spread upon a table a clean sheet of paper; take the lens apart, and with a camel-hair brush dust each of the combinations on both sides. If the surfaces of the lenses are very dirty and have lost their polish, make up the following: Nitric acid, 3 drops; alcohol, 1 ounce; distilled water, 2 ounces. Dip a tuft of filtering cotton in this solution, rub each side of the lens, then polish with an absolutely clean chamois. Clean the lens tube before replacing the lenses, each of which should be finally dusted with a camel-hair brush.

Moonlight Effects on Developing Paper (H. S. Hood).—Immerse in water, 5 ounces; ferric ammonium citrate, 12 grains; potassium ferricyanide, 12 grains; nitric acid, $\frac{2}{5}$ drams. Prints will assume a blue color. Wash until whites become clear.

Mounting Without Cockling (W. S. Davis).—Coat back of dry print with as strong a solution of warm gelatine (pure table gelatine will do) as can be spread easily. Allow to dry, then attach to mount by dampening the amount with water, then lay print in desired position; cover with a sheet of bond or smooth paper, and apply a warm flat iron until the gelatine melts. Very effective for thin mounting material, as there is no cockling if the mount contains just the right amount of water.

Paste, Starch (A. Lomax).—Powdered starch, 1 ounce; cold water, 12 ounces. Mix smooth with a glass rod, heat to boiling point. Boil half a minute stirring all the time. Use cold.

Poisons and Antidotes.—Administer the antidote as soon as possible. If a strong acid or alkali, or cyanide of potassium, has been swallowed, lukewarm water in large quantities should be swallowed at once. Where strong acids or alkalies have not been swallowed, rid the stomach of the poison by vomiting; for this purpose take 25 grains of zinc sulphate in warm water.

Polished surfaces: to Photograph.—Smear the surface with soft putty so as to deaden the reflections. Photograph the article against a black background, and stop off all reflections, allowing the light to come from one direction only. To photograph hollow cut glassware fill with ink or aniline black water dye. Before photographing machinery deaden the bright parts with putty.

Safe Light for Panchromatic Plates.—Take old dry plates and coat with the following: Water, 10 ounces, tartrazine, 75 grains; patent blue A, 75 grains; naphthol greens, 75 grains; sulphuric acid, 30 minims. Stain the plates as deeply as possible. Use two plates.

Stains: to Remove from the Hands.—Developer stains: solution of citric or oxalic acid. Silver nitrate stains: Water, 4 ounces; chloride of lime, 350 grains; sulphate of soda, 1 ounce. Apply with a brush.

Tarnished Daguerreotypes, to Restore.—Remove the silvered plate from the case and place it, image uppermost, under a box lid or other protector from dust, etc. Put a small piece of potassium cyanide into a graduate and pour over it 1 or 2 ounces of water. Hold the daguerreotype by the corner with a pair of pliers, rinse it in clear running water, then pour over it the weak cyanide solution (a 3 per cent. solution is usually employed), and return it to the graduate. Repeat this operation several times until the discoloration quite disappears. Wash well in running water, and then, before the surplus water has time to collect in tears upon the image, begin to dry the plate gradually over a spirit lamp, holding the plate in an inclined position so that it will dry from the uppermost corner. The secret of success is in the use of pure water for the final washings and the drying of the image without check or the formation of tears.

Test for Hypo: Potassium permanganate, 2 grains; potassium carbonate, 20 grains; distilled water, 40 ounces. Soak the plate or print to be treated in water for one hour, then remove and add to the water a few drops of the above solution, which will turn a greenish yellow or brown if the water is not free from hypo.

To Flatten Double-weight Prints (George D. Jopson).—A—9 ounces boiling water; $\frac{1}{2}$ ounce gelatine. B—3 ounces boiling water; $\frac{1}{2}$ drachm alum. C—2 drachms oil of cloves. Mix and strain through cheese cloth while hot. To use take a little from the stock and place in a cup. Place cup in hot water until backing is dissolved. Apply very thin to back of print with soft cloth or a tuft of cotton.

COMPARISON OF VALUES COMPILED BY CHAS. LE B. GOELLER

Taking for a standard f.8 as unit of measurement.
Speed increased. Opening twice as fast.

f.8 = 1	Twice as fast as	f.11.3	exposure 1 sec.
7.5 = $1\frac{1}{8}$	“ as	10.6	“ 0.88 sec.
6.8 = $1\frac{3}{8}$	“ as	9.6	“ 0.725 “
6.3 = $1\frac{3}{5}$	“ as	8.8	“ 0.625 “
6. = $1\frac{7}{9}$	“ as	8.5	“ 0.5625 “
5.6 = 2.	“ as	8	“ 0.5 “
4.5 = $3\frac{1}{6}$	“ as	6.3	“ 0.3125 “

UNITED STATES WEIGHTS AND MEASURES

According to Existing Standards

LINEAR

	Inches	Feet	Yards	Rods	Fur's	Mi.
12 inches = 1 foot.	12 =	1				
3 feet = 1 yard.	36 =	3 =	1			
5.5 yards = 1 rod.	198 =	16.5 =	5.5 =	1		
40 rods = 1 furlong.	7,920 =	660 =	220 =	40 =	1	
8 furlongs = 1 mile.	63,360 =	5,280 =	1,760 =	320 =	8 =	1

SURFACE—LAND

	Feet	Yards	Rods	Roods	Acres
144 sq. ins. = 1 sq. ft.					
9 sq. ft. = 1 sq. yd.	9 =	1			
30.25 sq. yds. = 1 sq. rod.	272.25 =	30.25 =	1		
40 sq. rods = 1 sq. rood.	10,890 =	1,210 =	40 =	1	
4 sq. roods = 1 acre.	43,560 =	4,840 =	160 =	4 =	1
640 acres = 1 sq. mile.	27,878,400 =	3,097,600 =	102,400 =	2,560 =	640

VOLUME—LIQUID

	Gills	Pints	Gallon	Cub. In.
4 gills = 1 pint.	32 =	8 =	1 =	231
2 pints = 1 quart.				
4 quarts = 1 gallon.				

FLUID

Gallon	Pints	Ounces	Drachms	Minims	Cubic Centimetres
1 =	8 =	128 =	1,024 =	61,440 =	3,785,435
	1 =	16 =	128 =	7,680 =	473,179
		1 =	8 =	480 =	29,574
			1 =	60 =	3,697

16 ounces, or a pint, is sometimes called a fluid pound.

TROY WEIGHT

Pound	Ounces	Pennyweights	Grains	Grams
1 =	12 =	240 =	5,760 =	373.24
	1 =	20 =	480 =	31.10
		1 =	24 =	1.56

APOTHECARIES' WEIGHT

lb.	℥	℥	℥	gr.	Grams
Pound	Ounces	Drachms	Scruples	Grains	
1 =	12 =	96 =	288 =	5,760 =	373.24
	1 =	8 =	24 =	480 =	31.10
		1 =	3 =	60 =	3.89
			1 =	20 =	1.30
				1 =	.06

The pound, ounce, and grain are the same as in Troy weight.

AVOIRDUPOIS WEIGHT

Pound	Ounces	Drachms	Grains (Troy)	Grams
1 =	16 =	256 =	7,000 =	453.60
	1 =	16 =	437.5 =	28.35
		1 =	27.34 =	1.77

ENGLISH WEIGHTS AND MEASURES

APOTHECARIES' WEIGHT

20 Grains	=	1 Scruple	=	20 Grains.
3 Scruples	=	1 Drachm	=	60 Grains.
8 Drachms	=	1 Ounce	=	480 Grains.
12 Ounces	=	1 Pound	=	5,760 Grains.

FLUID MEASURE

60 Minims	=	1 Fluid Drachm
8 Drachms	=	1 Fluid Ounce
20 Ounces	=	1 Pint
8 Pints	=	1 Gallon

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT

27 $\frac{1}{32}$ Grains	=	1 Drachm	=	27 $\frac{1}{32}$ Grains
16 Drachms	=	1 Ounce	=	437 $\frac{1}{2}$ Grains
16 Ounces	=	1 Pound	=	7,000 Grains

Precious Metals are usually sold by

TROY WEIGHT

24 Grains	=	1 Pennyweight	=	24 Grains
20 Pennyweights	=	1 Ounce	=	480 Grains
12 Ounces	=	1 Pound	=	5,760 Grains

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only 437 $\frac{1}{2}$ grains.

UNITED STATES FLUID MEASURE

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1	= 8	= 128	= 1,024	= 61,440	= 231.	= 58,328.886	= 3,785.44
	1	= 16	= 128	= 7,680	= 28.875	= 7,291.1107	= 473.18
		1	= 8	= 480	= 1.8047	= 455.6944	= 29.57
			1	= 60	= 0.2256	= 56.9618	= 3.70

IMPERIAL BRITISH FLUID MEASURE

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1	= 8	= 160	= 1,280	= 76,800	= 277.27384	= 70,000	= 4,543.732
	1	= 20	= 160	= 9,600	= 34.65923	= 8,750	= 567.966
		1	= 8	= 480	= 1.73296	= 437.5	= 28.398
			1	= 60	= 0.21662	= 54.69	= 3.550

METRIC SYSTEM OF WEIGHTS AND MEASURES

MEASURES OF LENGTH

DENOMINATIONS AND VALUES		EQUIVALENTS IN USE	
Myriameter.....	10,000 meters.	6.2137	miles.
Kilometer.....	1,000 meters.	.62137	mile, or 3,280 ft. 10 ins.
Hectometer.....	100 meters.	328.	feet and 1 inch.
Dekameter.....	10 meters.	393.7	inches.
Meter.....	1 meter.	39.37	inches.
Decimeter.....	1-10th of a meter.	3.937	inches.
Centimeter.....	1-100th of a meter.	.3937	inch.
Millimeter.....	1-1000th of a meter.	.0394	inch.

MEASURES OF SURFACE

DENOMINATIONS AND VALUES		EQUIVALENTS IN USE	
Hectare.....	10,000 square meters.	2.471	acres.
Are.....	100 square meters.	119.6	square yards.
Centare.....	1 square meter.	1,550.	square inches

MEASURES OF VOLUME

DENOMINATIONS AND VALUES			EQUIVALENTS IN USE	
NAMES	No. of Liters	CUBIC MEASURES	DRY MEASURE	WINE MEASURE
Kiloliter or stere.....	1,000	1 cubic meter.	1.308 cubic yards.	264.17 gallons.
Hectoliter....	100	1-10th cubic meter.	2 bu. and 3.35 pecks.	26.417 gallons.
Dekaliter....	10	10 cubic decimeters.	9.08 quarts.	2.6417 gallons.
Liter.....	1	1 cubic decimeter.	.908 quart.	1.0567 quarts.
Deciliter....	1-10	1-10th cubic decimeter.	6.1023 cubic inches.	.845 gill.
Centiliter....	1-100	10 cubic centimeters	.6102 cubic inch.	.338 fluid oz.
Milliliter....	1-1000	1 cubic centimeter.	.061 cubic inch.	.27 fl. drin.

WEIGHTS

DENOMINATIONS AND VALUES			EQUIVALENTS IN USE	
NAMES	Number of Grams	WEIGHT OF VOLUME OF WATER AT ITS MAXIMUM DENSITY	AVOIRDUPOIS WEIGHT	
Millier or Tonneau.....	1,000,000	1 cubic meter.	2204.6	pounds.
Quintal.....	100,000	1 hectoliter.	220.46	pounds.
Myriagram.....	10,000	10 liters.	22.046	pounds.
Kilogram or Kilo.....	1,000	1 liter.	2.2046	pounds.
Hectogram.....	100	1 deciliter.	3.5274	ounces.
Dekagram.....	10	10 cubic centimeters.	.3527	ounce.
Gram.....	1	1 cubic centimeter.	15.432	grains.
Decigram.....	1-10	1-10th of a cubic centimeter.	1.5432	grain.
Centigram.....	1-100	10 cubic millimeters.	.1543	grain.
Milligram.....	1-1000	1 cubic millimeter.	.0154	grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about $2\frac{1}{2}$ acres. The unit of capacity is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. The unit of weight is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c., is generally used instead of milliliter and cubic meter instead of kiloliter.

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE

1 cubic centimeter	=	17 minims			
2 cubic centimeters	=	34 "			
3 "	=	51 "			
4 "	=	68 "	or 1 dram	8 minims	
5 "	=	85 "	" 1 "	25 "	
6 "	=	101 "	" 1 "	41 "	
7 "	=	118 "	" 1 "	58 "	
8 "	=	135 "	" 2 drams	15 "	
9 "	=	152 "	" 2 "	32 "	
10 "	=	169 "	" 2 "	49 "	
20 "	=	338 "	" 5 "	38 "	
30 "	=	507 "	" 1 ounce	0 dram	27 minims
40 "	=	676 "	" 1 "	3 drams	16 "
50 "	=	845 "	" 1 "	6 "	5 "
60 "	=	1014 "	" 2 ounces	0 "	54 "
70 "	=	1183 "	" 2 "	3 "	43 "
80 "	=	1352 "	" 2 "	6 "	32 "
90 "	=	1521 "	" 3 "	1 "	21 "
100 "	=	1690 "	" 3 "	4 "	10 "
1000 "	=	1 liter =	35 "	1 "	40 "

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT

The following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes.

1 gram	=	15 $\frac{2}{5}$ grains.			
2 grams	=	30 $\frac{4}{5}$ "			
3 "	=	46 $\frac{1}{5}$ "			
4 "	=	61 $\frac{4}{5}$ "	or	1 dram	1 $\frac{4}{5}$ grain
5 "	=	77 $\frac{1}{5}$ "	"	1 "	17 $\frac{1}{5}$ grains
6 "	=	92 $\frac{3}{5}$ "	"	1 "	32 $\frac{3}{5}$ "
7 "	=	108 "	"	1 "	48 "
8 "	=	123 $\frac{2}{5}$ "	"	2 drams	3 $\frac{2}{5}$ "
9 "	=	138 $\frac{4}{5}$ "	"	2 "	18 $\frac{4}{5}$ "
10 "	=	154 $\frac{2}{5}$ "	"	2 "	34 $\frac{2}{5}$ "
11 "	=	169 $\frac{4}{5}$ "	"	2 "	49 $\frac{4}{5}$ "
12 "	=	185 $\frac{1}{5}$ "	"	3 "	5 $\frac{1}{5}$ "
13 "	=	200 $\frac{3}{5}$ "	"	3 "	20 $\frac{3}{5}$ "
14 "	=	216 "	"	3 "	36 "
15 "	=	231 $\frac{2}{5}$ "	"	3 "	51 $\frac{2}{5}$ "
16 "	=	247 "	"	4 "	7 "
17 "	=	262 $\frac{2}{5}$ "	"	4 "	22 $\frac{2}{5}$ "
18 "	=	277 $\frac{4}{5}$ "	"	4 "	37 $\frac{4}{5}$ "
19 "	=	293 $\frac{1}{5}$ "	"	4 "	53 $\frac{1}{5}$ "
20 "	=	308 $\frac{3}{5}$ "	"	5 "	8 $\frac{3}{5}$ "
30 "	=	463 "	"	7 "	43 "
40 "	=	617 $\frac{1}{5}$ "	"	10 "	17 $\frac{1}{5}$ "
50 "	=	771 $\frac{3}{5}$ "	"	12 "	51 $\frac{3}{5}$ "
60 "	=	926 "	"	15 "	26 "
70 "	=	1080 $\frac{1}{5}$ "	"	18 "	0 $\frac{1}{5}$ "
80 "	=	1234 $\frac{3}{5}$ "	"	20 "	34 $\frac{3}{5}$ "
90 "	=	1389 "	"	23 "	9 "
100 "	=	1543 $\frac{1}{5}$ "	"	25 "	43 $\frac{1}{5}$ "
1000 "	=	1 kilogram	= 32 oz., 1 dr., 12 $\frac{2}{5}$ gr.		

THE ELEMENTS: THEIR NAMES, SYMBOLS, AND ATOMIC WEIGHTS OXYGEN STANDARD.

Compiled by HENRY F. RAESS.

1915

Aluminum...Al	27.10	Holmium....Ho	163.50	Rhodium...Rh	102.90
Antimony...Sb	120.20	Hydrogen...H	1.008	Rubidium...Rb	85.45
Argon.....A	39.88	Indium.....In	114.80	Ruthenium...Ru	101.70
Arsenic....As	74.96	Iodine.....I	126.92	Samarium...Sa	150.40
Barium....Ba	137.37	Iridium.....Ir	193.10	Scandium...Sc	44.10
Bismuth...Bi	208.00	Iron.....Fe	55.84	Selenium...Se	79.20
Boron.....B	11.00	Krypton....Kr	82.92	Silicon.....Si	28.30
Bromine...Br	79.92	Lanthanum...La	139.00	Silver.....Ag	107.88
Cadmium...Cd	112.40	Lead.....Pb	207.10	Sodium.....Na	23.00
Caesium...Cs	132.81	Lithium....Li	6.94	Strontium...Sr	87.63
Calcium...Ca	40.07	Lutecium...Lu	174.00	Sulphur....S	32.07
Carbon....C	12.00	Magnesium..Mg	24.32	Tantalum...Ta	181.50
Cerium....Ce	140.25	Manganese...Mn	54.93	Tellurium...Te	127.50
Chlorine...Cl	35.46	Mercury....Hg	200.60	Terbium...Tb	159.20
Chromium..Cr	52.00	Molybdenum Mo	96.00	Thallium...Tl	204.00
Cobalt....Co	58.97	Neodymium..Nd	144.30	Thorium...Th	232.40
Columbium.Cb	93.50	Neon.....Ne	20.20	Thulium...Tm	168.50
Copper....Cu	63.57	Nickel.....Ni	58.68	Tin.....Sn	119.00
Dysprosium Dy	162.50	Niton.....Nt	222.40	Titanium...Ti	48.10
Erbium....Er	167.70	Nitrogen...N	14.01	Tungsten...W	184.00
Europium..Eu	152.00	Osmium.....Os	190.90	Uranium...U	238.50
Fluorine...F	19.00	Oxygen.....O	16.00	Vanadium...V	51.00
Gadolinium.Gd	157.30	Palladium...Pd	106.70	Xenon.....Xe	130.20
Gallium...Ga	69.90	Phosphorus..P	31.04	Ytterbium...Yb	173.50
Germanium.Ge	72.50	Platinum....Pt	195.20	Yttrium....Yt	89.00
Glucium...Gl	9.10	Potassium...K	39.10	Zinc.....Zn	65.37
Gold.....Au	197.20	Praseodymium Pr	140.60	Zirconium...Zr	90.60
Helium....He	3.96	Radium.....Ra	226.40		

TABLE OF COMPARATIVE PLATE SPEED
NUMBERS

H & D	Watkins P No.	Wynne F No.	H & D	Watkins P No.	Wynne F No.
10	15	24	220	323	114
20	30	35	240	352	120
40	60	49	260	382	124
80	120	69	280	412	129
100	147	77	300	441	134
120	176	84	320	470	138
140	206	91	340	500	142
160	235	98	380	558	150
200	294	109	400	588	154

The above Watkins and Wynne numbers are equivalent to the H and D, only when the latter is determined in accordance with the directions of Hurter and Driffeld, that is with pyro-soda developer and using the straight portion only of the density curve.

To convert H and D into Watkins: Multiply H and D by 50 and divide by 34. For all practical purposes the Watkins P number is $1\frac{1}{2}$ times H and D.

To convert Watkins into Wynne F Nos.: Extract the square root and multiply by 6.4.

The above methods have been approved by the Watkins Meter Company and the Infallible Exposure Meter Company.

THERMO DEVELOPMENT

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TABLE OF TEMPERATURES				
Degrees Fahr.	Min. Tray	Min. Tank	Min. Tray	Min. Tank
T.C.1.9				
80	3½	12	1¾	7¾
78	3½	13	2	8½
76	3½	14	2½	9½
74	4	15	2½	10½
72	4½	16	2¾	11½
70	4½	17	3	13
68	5	18½	3½	14½
66	5½	19½	3½	16
64	5½	21	4	18
62	6½	22½	4½	20
60	6½	24	5	22
58	7	26	5½	24½
56	7½	28	6	27
54	8	30	6½	30
52	8½	32	7½	33
50	9½	34	8½	37
48	10	37	9½	41½
46	10½	40	10½	46
44	11½	43	11½	51½
42	12½	46	12½	57
40	13½	49	14½	63

TABLE OF DEVELOPMENT SPEEDS				
ANSICO FILM, MS. BARNET—Super-speed				
Ortho, M; Extra Rapid Ortho, MS. Red Seal, M; Red Diamond, MS; Self-screen Ortho, MS; CENTRAL—Special XX., S; Special, M; Comet, M; Colornon, MQ; Panortho, MQ; CRAMER—Crown S; Anchor, MQ; Banner X, S; Inst. Iso., MQ; Med. Iso, MQ; Commercial Isonon, MQ; Portrait Isonon, M; Trichromatic, MQ; Spectrum, MQ; Slow Iso, MQ; Contrast, VVQ. ENSIGN FILM, MS. HAMMER—Special Extra Fast, MS; Extra Fast, M; Aurora Extra Fast, MS; Ortho Extra Fast, M; Ortho Nonhal., M; Fast, MQ; Slow, VQ. Ortho Slow, VQ. ILFORD—Monarch, VS; Zenith, VS; Special Rapid, VS; Rapid Chromatic, M; Ordinary, Q. IMPERIAL—Flash Light, M; Special Sensitive, MQ; Ortho-				

chrome S.S., MQ; Special Rapid, S; Orthochrome S.R., MS; Non-filter, MQ. KODAK—Speed Film, S; N.C. Film, S; Portrait Film, S. MARION—Record, S; P.S.; MS. PAGET—XXX M; XXXXX, MS; Swift, S; Ex. Spec. Rap., S; Ortho, Ex. Spec. Rap., MQ; Panchro Ord, Q; Panchro. Color, VQ; Spec. Rap., S; Hydra Panchro., MQ; Hydra Rapid, MQ. PREMO FILM PACK—S. SEED—Graflex, S; 30 Gilt Edge, MS; 26 X, MS; 23, MQ; L Ortho, MQ; Non-halation, MQ; Panchromatic. VQ. STANDARD—Extra, Orthonon, MQ; Polychrome, MQ. STANLEY—50, M; Commercial, MQ. WELLINGTON—Extreme, S; Xtra Speedy, MS; Film, MS; Iso Speedy, M; Portrait Speedy, M; Anti-Screen, M; Speedy Spec. Rap., M; Ortho Process, M; Written—Panchro, MQ; Process Panchro, Q.

WATKINS THERMO PYRO-SODA T. C. 1.9	
a. Potassium metabisulphite.....	80 gr.
Pyro	160 gr.
Sodium sulphite, dry.....	1 oz.
Water to make.....	10 oz.
b. Sodium carbonate, dry.....	2 oz.
Potassium bromide.....	40 gr.
Water to make.....	10 oz.
MODIFIED THERMO M. Q. T. C. 1.9	
a. Potassium metabisulphite.....	60 gr.
Metol	30 gr.
Hydrochinon	90 gr.
Water to make.....	20 oz.
b. Sodium sulphite, dry.....	1 oz.
Sodium carbonate, dry.....	1½ oz.
Water to make.....	20 oz.
MODIFIED THERMO D. Q. T. C. 2.6	
a. Potassium metabisulphite.....	60 gr.
Duritol	30 gr.
Hydrochinon	90 gr.
Water to make.....	20 oz.
b. Sodium sulphite, dry.....	1½ oz.
Sodium carbonate, dry.....	2 oz.
Water to make.....	20 oz.

INSTRUCTIONS.—Look up the Development Speed of the plate or film and mix the developer as directed for that class, USING WATER WHICH HAS STOOD IN THE ROOM LONG ENOUGH TO ATTAIN ROOM TEMPERATURE. In safe ruby light (or total darkness) place the plate in the tray, flow it with developer, cover the tray light-tight, and note the time. We recommend handling plates in total darkness and using white light while they are covered. Now observe the temperature of the room and consult the Table of Temperatures, where the correct time for development will be found opposite the degree and under the Temperature-Coefficient of the developer in use. The tray may be rocked now and then during development, but the plate should not be removed from the solution until the time is up. Then turn out the white light and rinse and fix the plate by safe light or in a covered tank.

If the first trial does not give the right printing quality to suit your requirements, classify the plate one class nearer VS for more or one class farther from VS for less contrast.

DILUTION OF DEVELOPER.—			VVQ	VQ	Q	MQ	M	MS	S	VS		
Watkins Thermo Pyro-Soda....			1	1½	1¾	2¼	3	4	5	6¾		
Modified Thermo M.-Q.....	}		1½	2	2¾	3½	4½	6	8	10		
Modified Thermo Duratol.....												
drams of each stock to be diluted to make total volume 3 ounces for tray or 10 ounces for tank development.												
Rodinal (Citol, Azol, Certinal) ..	20		26		35		45		60	80	105	135
minims solution to be made up to 3 ounces for tray or 9 ounces for tank.											T. C. 1.9.	

Dilution of Dev.	V VQ	V Q	Q	MQ	M	MS	S	VS
Metabissulphite grs.								
Potass..... 1.68	2½	3.	4.	5.	6.8	9.	12.	
Metol..... .84 or 1.68	1½ or 2½	1½ or 3	2. or 4	2½ or 5	3.4 or 6.8	4½ or 9	6 or 12	
Hydrochinon.. 2.52	1.68 3½	2½ 4½	3 6.	4 7½	5 10.2 or 6.8	13½ 9	18 12	
Sod. Sulphite.. 12.5	16½	22.	28.	37.	50.	66.	82.	
Sod. Carbonate 18.75	24½	33.	42.	55.	70.	99.	123.	
Water..... 30 3	30 3	30 3	30 3	30 3	30 3	30 3	30 3	

*For flashlight pictures equal parts of Hydrochinon and Eikonogen give softer effects.

N.B.—A single portion of developer should be used for only one plate, but the used developer (except pyro) should be saved for paper. If fog occurs, add to each ounce of water used for diluting, 7½ to 10 grs. dry sulphite.



May L. Smith.



TABLE FOR CALCULATING DISTANCES IN ENLARGING OR REDUCING

From The British Journal Photographic Almanac

Focus of Lens	Times of Enlargement and Reduction							
Inches	1 Inch	2 Inch-es	3 Inch-es	4 Inch-es	5 Inch-es	6 Inch-es	7 Inch-es	8 Inch-es
2.....	4 4	6 3	8 2 $\frac{2}{3}$	10 2 $\frac{1}{2}$	12 2 $\frac{2}{5}$	14 2 $\frac{1}{3}$	16 2 $\frac{2}{7}$	18 2 $\frac{1}{4}$
2 $\frac{1}{2}$	5 5	7 $\frac{1}{2}$ 3 $\frac{3}{4}$	10 3 $\frac{1}{3}$	12 $\frac{1}{2}$ 3 $\frac{1}{8}$	15 3	17 $\frac{1}{2}$ 2 $\frac{9}{10}$	20 2 $\frac{6}{7}$	22 $\frac{1}{2}$ 2 $\frac{3}{16}$
3.....	6 6	9 4 $\frac{1}{2}$	12 4	15 3 $\frac{3}{4}$	18 3 $\frac{2}{5}$	21 3 $\frac{1}{2}$	24 3 $\frac{2}{7}$	27 3 $\frac{3}{8}$
3 $\frac{1}{2}$	7 7	10 $\frac{1}{2}$ 5 $\frac{1}{4}$	14 4 $\frac{2}{3}$	17 $\frac{1}{2}$ 4 $\frac{3}{4}$	21 4 $\frac{1}{5}$	24 $\frac{1}{2}$ 4 $\frac{1}{12}$	28 4	31 $\frac{1}{2}$ 3 $\frac{9}{10}$
4.....	8 8	12 6	16 5 $\frac{1}{3}$	20 5	24 4 $\frac{2}{5}$	28 4 $\frac{2}{3}$	32 4 $\frac{2}{7}$	36 4 $\frac{1}{2}$
4 $\frac{1}{2}$	9 9	13 $\frac{1}{2}$ 6 $\frac{3}{4}$	18 6	22 $\frac{1}{2}$ 5 $\frac{3}{5}$	27 5 $\frac{2}{5}$	31 $\frac{1}{2}$ 5 $\frac{1}{4}$	36 5 $\frac{1}{7}$	40 $\frac{1}{2}$ 5 $\frac{1}{16}$
5.....	10 10	15 7 $\frac{1}{2}$	20 6 $\frac{2}{3}$	25 6 $\frac{1}{4}$	30 6	35 5 $\frac{5}{6}$	40 5 $\frac{5}{7}$	45 5 $\frac{5}{8}$
5 $\frac{1}{2}$	11 11	16 $\frac{1}{2}$ 8 $\frac{1}{4}$	22 7 $\frac{1}{3}$	27 $\frac{1}{2}$ 6 $\frac{4}{5}$	33 6 $\frac{1}{2}$	38 $\frac{1}{2}$ 6 $\frac{5}{12}$	44 6 $\frac{2}{7}$	49 $\frac{1}{2}$ 6 $\frac{3}{16}$
6.....	12 12	18 9	24 8	30 7 $\frac{1}{2}$	36 7 $\frac{1}{5}$	42 7	48 6 $\frac{6}{7}$	54 6 $\frac{3}{4}$
7.....	14 14	21 10 $\frac{1}{2}$	28 9 $\frac{1}{3}$	35 8 $\frac{3}{4}$	42 8 $\frac{2}{5}$	49 8 $\frac{1}{6}$	56 8	63 7 $\frac{7}{8}$
8.....	16 16	24 12	32 10 $\frac{2}{3}$	40 10	48 9 $\frac{3}{5}$	56 9 $\frac{1}{3}$	64 9 $\frac{1}{7}$	72 9
9.....	18 18	27 13 $\frac{1}{2}$	36 12	45 11 $\frac{1}{4}$	54 10 $\frac{2}{5}$	63 10 $\frac{1}{2}$	72 10 $\frac{2}{7}$	81 10 $\frac{1}{8}$

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical center. The use of the table will be seen from the following illustration: A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of 6 inches equivalent focus. He must therefore look for 4 on the upper horizontal line and for 6 on the first vertical column and carry his eye to where these two join, which will be 30-7 $\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the center of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times, the same method must be followed; but in this case the greater number will represent the distance between the lens and the picture to be copied, the latter that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be 12 inches, as this number is not in the column of focal lengths, look out for 6 in this column and multiply by 2, and so on with any other numbers.

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS WHEN SHARP FOCUS IS SECURED ON INFINITY

Focal Length of Lens in Inches	Ratio marked on Stops													
	f/4	f/5.6	f/6	f/7	f/8	f/10	f/11	f/15	f/16	f/20	f/22	f/32	f/44	f/64
	Number of feet after which all is in focus													
4	33	24	22	19	17	13	12	9	8	7	6	4	3	2
4½	38	27	25	21	19	15	14	10	10	7	7	5	3½	2½
4¾	42	30	28	24	21	17	15	11	11	8½	7½	5½	4	3
5	47	34	31	27	24	19	17	12	12	9½	8½	6	5	3
5½	52	36	35	30	26	21	19	14	13	10½	9½	6½	5½	3½
5¾	57	40	38	33	28	23	21	15	14	11½	10½	7	5½	3½
6	63	45	43	36	31	25	23	17	15	12½	11½	7½	6	4
6½	68	50	46	38	34	27	25	18	17	13½	13	8½	6½	4
6¾	75	54	50	42	38	30	28	20	19	15	14	9	7	4½
7	81	58	54	46	40	32	29	22	20	16	15	10	7½	5
7½	87	62	58	50	44	35	32	23	22	17½	16	11	8	5½
7¾	94	67	63	54	47	38	34	25	24	19	17	12	8½	6
8	101	72	68	58	51	40	37	27	25	20	18	12½	9	6
8½	109	78	73	62	54	44	39	29	27	22	20	13½	10	6½
8¾	117	83	78	64	58	47	42	31	29	24	21	14½	10½	7
9	124	90	83	71	62	50	45	33	31	25	22	15½	11	7½
9½	132	96	88	76	68	52	48	36	32	28	24	16	12	8
9¾	141	100	94	80	71	56	51	37	35	29	25	17½	12½	8½
10	150	104	100	84	76	60	56	40	38	30	27	19	13½	9
10½	156	111	104	89	78	63	57	42	39	32	29	20	14	10
11	168	120	112	96	84	67	61	45	42	34	31	21	15	10½
11½	180	127	116	101	90	71	65	47	45	35	32	22	16	11
11¾	190	133	125	107	95	75	68	50	47	37	34	24	17	12
12	197	141	131	113	99	79	72	52	50	39	36	25	18	12½
12½	208	148	140	120	104	83	75	55	52	42	38	26	19	13

If sharp focus is secured on any of the distances shown, then with the stop indicated all objects are in focus from half the distance focused on up to infinity.

LENGTH OF STUDIO

REQUIRED FOR LENSES OF DIFFERENT FOCAL LENGTHS
FROM 6 TO 8 FEET IS ALLOWED FOR THE CAMERA AND
OPERATOR

From "Photographic Lenses" by BECK and ANDREWS

Focus of Lens	Size	Kind of Portrait	Length of Studio	Dist. of Lens from Object
Inches			In Feet	In Feet
6	Carte de Visite 3¼x4¼.....	Full Length	18 to 20	11 to 12
7½	Carte de Visite.....	Full Length	22 to 25	14 to 15
8½	Carte de Visite.....	Full Length	24 to 28	17 to 19
9½	Cabinet and smaller groups.....	Bust	10 to 15	5
		Full Length	20 to 23	12 to 13
		Bust	12 to 17	7
		Full Length	25 to 30	17 to 18
11	Cabinet and 5x7 groups.....	Bust	13 to 20	8
14½	Cabinets, panels and 6½x8½ groups.....	Full Length	32 to 40	23 to 24
		Bust	14 to 20	7
		Full Length	20 to 25	13
19	10x12 portraits or groups.....	Bust	14 to 20	7
		Full Length	25 to 30	14
24	16x20 portraits or groups.....	Bust	14 to 20	8

"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM

$$\frac{f}{1} \text{ TO } \frac{f}{100}$$

In the following table Mr. S. A. Warburton calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14.06	58	210.25
$1\frac{1}{4}$	.097	16	16	59	217.56
1.414	$\frac{1}{8}$	17	18.06	60	225.00
$1\frac{1}{2}$	.140	18	20.25	61	232.56
$1\frac{3}{4}$	.191	19	22.56	62	240.25
2	$\frac{1}{4}$	20	25.00	63	248.06
$2\frac{1}{4}$	.316	21	27.56	64	256
$2\frac{1}{2}$	.390	22	30.25	65	264.06
2.828	$\frac{1}{2}$	22.62	32	66	272.25
$2\frac{3}{4}$	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
$3\frac{1}{4}$	.660	25	39.06	69	297.56
$3\frac{1}{2}$	.765	26	42.25	70	306.25
$3\frac{3}{4}$	.878	27	45.56	71	315.06
4	1	28	49.00	72	324.00
$4\frac{1}{4}$	1.12	29	52.56	73	333.06
$4\frac{1}{2}$	1.26	30	56.25	74	342.25
$4\frac{3}{4}$	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
$5\frac{1}{4}$	1.72	33	68.06	77	370.56
$5\frac{1}{2}$	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
$5\frac{3}{4}$	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
$6\frac{1}{4}$	2.44	38	90.25	82	420.25
$6\frac{1}{2}$	2.64	39	95.06	83	430.56
$6\frac{3}{4}$	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
$7\frac{1}{4}$	3.28	42	110.25	86	462.25
$7\frac{1}{2}$	3.51	43	115.56	87	473.06
$7\frac{3}{4}$	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
$8\frac{1}{4}$	4.25	45.25	128	90	506.25
$8\frac{1}{2}$	4.51	46	132.25	90.50	512
$8\frac{3}{4}$	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
$9\frac{1}{4}$	5.34	49	150.06	93	540.56
$9\frac{1}{2}$	5.64	50	156.25	94	552.25
$9\frac{3}{4}$	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625
14	12.25	57	203.06		

American Photographic Societies

This list is compiled from information received from an inquiry form sent to the societies during the latter half of 1922. It includes many societies not given in the 1922 Annual, but falls short of completeness as a record of the photographic societies of America. Secretaries of societies not here listed are urged to send us particulars of their organization so that the list may be fully representative of society activities.—Editor.

- ALLENTOWN CAMERA CLUB**—Allentown, Pa. Headquarters, 708 Hamilton St. *President*, Chas Schellenberger; *Vice-President*, Moulton Frantz; *Secretary*, W. Ross Angstadt, 127 N. Franklin St., Allentown, Pa. Member Associated Camera Clubs of America. Meetings every Tuesday. Membership, 45.
- AMERICAN INSTITUTE PHOTOGRAPHIC SECTION**—New York City. Headquarters, 322-324 West 23d Street. Established March 26, 1859. Stated meetings, first and third Mondays of each month. No meetings during Summer months. *Chairman*, Oscar G. Mason; *Vice-Chairman*, Robert A. B. Dayton; *Treasurer*, James Y. Watkins; *Secretary*, John W. Bartlett, M.D., F.R.P.S., 149 West 94th Street.
- ASSOCIATED CAMERA CLUBS OF AMERICA**. Headquarters, 27 Franklin St., Newark, N. J. *President*, Todd Hazen, Oregon Camera Club; *Vice-President*, M. R. Witt, Photographic Society of Phila.; *Secretary*, Louis F. Bucher, Newark Camera Club; *Treasurer*, Henry C. Brewster, Newark Camera Club. Association Slide Director, W. R. Frisbie, New Haven Camera Club; Association Print Director, E. Roy Monroe, Portland (Me.) Camera Club. Motive—Closer affiliation of Camera Clubs, Annual exhibits, Interchanges of Prints and Slides, as well as ideas, literature and the general promotion of artistic photography through the medium of the Camera Club or Photographic Society. Membership, thirty-four clubs. Association organized May 1, 1919. Correspondence invited with non-member organizations and those desiring to form a club or society.
- BERKSHIRE PHOTOGRAPHIC SOCIETY**—Headquarters, care of A. W. Jacobs Studio, 30 North St., Pittsfield, Mass. Meetings 2nd Friday of each month. Member Associated Camera Clubs of America.
- BOULDER CAMERA CLUB**—Care of University of Colorado, Boulder, Colo. *President*, Severance Burrage.
- BOSTON CAMERA CLUB**—Boston, Mass. Established 1881. Incorporated 1886. Membership, 75. *President*, P. Hubbard; *Secretary*, John H. Thurston, 50 Bromfield Street.
- BOSTON YOUNG MEN'S CHRISTIAN UNION CAMERA CLUB**—Boston, Mass. Headquarters, 48 Boylston Street, Boston. Organized, 1908. *President*, Herbert B. Turner; *Vice-President*, Gardner R. P. Barker; *Treasurer*, F. Chester Everett; *Secretary*, Ernest Gustavsen, 234 Hyde Park Ave., Forest Hills. Meetings first Tuesday each month at club rooms, 48 Boylston Street. Member Associated Camera Clubs of America.
- BROOKLYN INSTITUTE OF ARTS AND SCIENCES, PHOTOGRAPHIC SECTION**—Headquarters, Academy of Music Building, Lafayette Ave., Brooklyn, N. Y. Organized 1886. Membership 75. Meetings for general discussion and criticism the second Monday each month except July and August. Courses in Rudiments of Photography, Advanced Photography, Pictorial Photography, Loan Exhibitions. Annual exhibit of the Department in May. Demonstrations of the various processes every third Friday evening. *President*, Wm. Elbert Macnaughton; *Vice-President*, Wm. Alexander Alcock; *Secretary*, Sophie Louisa Lauffer, 645 Putnam Ave., Brooklyn; *Treasurer*, J. Halstead Patterson.
- BUFFALO CAMERA CLUB**—Buffalo, N. Y. Headquarters, Kinne Building, corner Main and Utica Streets. Annual election of officers, fourth Thursday in April; regular meeting nights, second and fourth Tuesdays of each month. *President*, C. R. Phipps; *Vice-President*, C. L. Moore; *Secretary*, R. R. McGeorge, 142 Dorchester Road. Member Associated Camera Clubs of America.
- CALIFORNIA CAMERA CLUB**—San Francisco, Cal. Headquarters, 833 Market St., San Francisco, Cal. Established March 18, 1890. Incorporated April 5, 1890. Membership 375. Date of meeting second Tuesday, monthly. Monthly print exhibitions and illustrated lectures. *President*, Edward H. Kemp; *Secretary*, Wm. C. Mackintosh. Members of other clubs are cordially invited to visit our rooms when in San Francisco. Member Associated Camera Clubs of America.

- THE CAMERA CLUB**—New York. Headquarters, 121 West 68th St. Established in 1884 and incorporated in 1896 upon consolidation with the New York Camera Club, 121 West 68th St. Membership 245. Annual meeting first Thursday after the first Monday in January. *President*, J. Henry; *Secretary*, W. N. Capen. Affiliated with The McKinley Royal Photographic Society of Great Britain.
- "CAMERADS"**—New Brunswick, N. J. Headquarters, corner Church and George Streets. Established April 24, 1890. *Secretary*, Harvey Iredell; D.D.S., Lock Box 34, New Brunswick.
- CAMERA CLUB OF CINCINNATI**, Cincinnati, Ohio—Formed 1913. Reorganized June, 1921. Membership 35. Club and dark-rooms Arno Building, 4th and Sycamore Streets. Meetings first and third Mondays of each month. *President*, Chas H. Partington; *Vice-President*, Alice F. Foster; *Secretary*, G. A. Ginter. Member of the Associated Camera Clubs.
- CAMERA CLUB OF WATERBURY**—Waterbury, Conn., P. O. Box 712. Organized Sept., 1919. Meets Monday evenings at the Y. M. C. A. Room 10, 136 West Main St. *President*, Arthur H. Ganung; *Secretary*, Hollis M. French. Member Associated Camera Clubs of America.
- CAMERA PICTORIALISTS OF LOS ANGELES**—Los Angeles, Cal. Headquarters, 811 Washington Building. Association formed for strictly pictorial work; the holding of an annual International Salon; and for the good of the cause generally. Meeting, first Monday of month. *Director*, W. A. Hudson; *Secretary*, N. P. Moerdyke.
- CAPE ANN CAMERA CLUB**—Headquarters, Gloucester, Mass.
- CAPITAL CAMERA CLUB**—Washington, D. C., 638 I Street, N. W. Founded May 1, 1891. Annual meeting, first Thursday in January. *President*, Frederick L. Pittman; *Vice-President*, G. W. Anderson; *Secretary*, George M. Miller, 638 I St., N. W.; *Treasurer*, J. H. Weimer; *Librarian*, Miss Lucy Powell. Date of annual exhibition, March. Member Associated Camera Clubs of America.
- CENTRAL Y. M. C. A. CAMERA CLUB**—Headquarters, 1421 Arch Street, Philadelphia, Pa. Club organized 25 years ago. Meetings, third Monday in Month. *President*, Bernard B. Wolff; *Vice-Presidents*, R. E. Wilson, J. F. Jackson; *Secretary-Treasurer*, S. R. C. Cooper. Membership, 62. Member Associated Camera Clubs of America.
- CHAFFEY CAMERA CLUB**—Ontario, Upland, Cal. Headquarters, Chaffey Library. Meetings held second Wednesday of each month, 7.30 p. m. *President*, Norban Hargrove; *Vice-President*, Francis Wagner; *Secretary-Treasurer*, Albert Salter.
- CHICAGO CAMERA CLUB**, Chicago, Ill. Headquarters, 31 W. Lake Street. Established February 14, 1904. Incorporated February 19, 1904. Meetings every Wednesday. *President*, Raymond W. Trowbridge; *Vice-President*, Arthur E. Anderson; *Secretary*, Frank W. Hatten, 5943 Winthrop Ave.; *Treasurer*, Nils Tempte. Member Associated Camera Clubs of America.
- CHICAGO PHOTO FELLOWS**—Chicago, Ill. Organized September 8, 1909. Membership, 8. *Correspondent*, F. M. Tuckerman, 1109 Railway Exchange, Chicago.
- CLEVELAND PHOTOGRAPHIC SOCIETY**—Cleveland, Ohio. Headquarters, The Towers, 6106½ Euclid Ave. Established June 7, 1913. Permanent organization effected at meeting of June 18. Incorporated October 9, 1920. Meetings every Wednesday. *President*, A. H. Bemis; *Vice-President*, C. H. Shipman; *Financial Secretary*, Max E. Reuter; *Corresponding Secretary*, H. G. Cleveland; *Treasurer*, G. Y. Tange. Member Associated Camera Clubs of America.
- COLUMBIA PHOTOGRAPHIC SOCIETY**—Philadelphia, Pa. Headquarters, 4605 Germantown Ave., Philadelphia. Established 1889. Incorporated July 3, 1894. Membership, 80. Business meeting first Monday of each month; other Mondays, lectures or demonstrations. Member Associated Camera Clubs of America. *President*, C. E. Harrison; *Vice-President*, H. E. Cassel; *Treasurer*, Allan Falconer; *Secretary*, C. F. Davis.
- DALLAS CAMERA CLUB**, 320½ North Ervay St., Dallas, Tex. Organized July 20, 1921. *President*, A. M. Belsher, *Vice-President*, V. H. Schoffelmayer, *Secretary-Treasurer*, E. H. Brown. Regular meetings every Tuesday. Monthly competition. Free school for amateurs every Friday evening. Annual competition about November. Membership, 35.
- DARTMOUTH CAMERA CLUB**—Headquarters, 7-8 Robinson Hall, Hanover, N. H. Organized, 1915. Membership, 30. *President*, Jack Strauss. All communications addressed to Prof. Leland Griggs, Hanover, N. H. Member Associated Camera Clubs of America.
- DETROIT CAMERA CLUB**—Detroit, Mich. (Reincorporated, January, 1921). Club rooms, 43 Montcalm St. West. *President*, P. M. Hickey, M.D.; *Vice-President*, H. F. Wegener; *Secretary-Treasurer*, W. E. Taylor, 314 W. Congress St., Detroit, Mich. Member of the Associated Camera Clubs. Meetings held in the club rooms every Friday evening. Visitors welcome.

- ELMIRA CAMERA CLUB**—Elmira, N. Y. Headquarters, 116 Baldwin Street, Elmira. Established 1902. Membership, 30. Meets first Wednesday each month. *President*, C. G. Leonardi; *Secretary-Treasurer*, E. Radeker Stancliff, 240 Lake Street. Member Associated Camera Clubs of America.
- ELYSIAN CAMERA CLUB**—307 Washington St., Hoboken, N. J. Established 1902. Date of meeting second Thursday of each month. Membership 68 active. *Hon. Pres.*, Julius Nelson; *President*, Paul Marsicano; *Vice-President*, Adolph Geiger; *Secretary*, J. Henry Wendt, 805 Washington St., Hoboken, N. J. Member Associated Camera Clubs of America.
- GUILD OF PHOTOGRAPHERS OF THE SOCIETY OF ARTS AND CRAFTS OF BOSTON, MASS.**—*Dean*, Herbert B. Turner; *Secretary and Treasurer*, Ralph Osborne; *Councilors*, Mrs. Dorothy Jarvis, Alton H. Blackinton. Organized Feb. 18, 1916. Meetings held at members' studios.
- GLASSBORO HIGH SCHOOL CAMERA CLUB**—Headquarters High School Building. Organized and established 1919 under the direction of Prof. J. A. Ernest Zimmermann. Meets every first and third Tuesday during the school year. Membership 45. Composed of students and alumni. *President*, Seldon Aylsworth; *Vice-President*, J. A. Kaiser; *Secretary-Treasurer*, Ruth Lippincott. Club conducts a yearly prize exhibit during the month of April.
- GRAND RAPIDS CAMERA CLUB**—Member Associated Camera Clubs of America. Headquarters, 106 Monroe Street, where demonstrations and inspiration meetings are held each Thursday evening from September to June, inclusive, with occasional field days during the summer months. *President*, Prof. H. C. Doane; *Vice-President*, J. O. Rogers; *Treasurer*, A. Steenhagen; *Secretary*, Miss Loa G. Winegar. Member Associated Camera Clubs of America.
- INDIANAPOLIS CAMERA CLUB**—Headquarters, 406 Rauh Bldg., Indianapolis. Member Associated Camera Clubs of America.
- INTERNATIONAL PHOTOGRAPHIC ASSOCIATION**—San Francisco, Cal. Founded 1908. *President*, F. B. Hinman, Evergreen, Cal.; *General Secretary*, A. E. Davies, 1327 Grove St., Berkeley, Cal.; *Director Post Card Division*, John Biesman, Hemlock, Ohio; *Director Lantern-Slide Division*, A. E. Davies, 1327 Grove Street, Berkeley, Cal. *State Secretaries*: California—A. E. Davies, 1327 Grove St., Berkeley. Colorado—H. E. High, 1023 Champa St., Denver. Idaho—Eugene Clifford, 902 9th Ave., Lewiston. Iowa—Harry B. Nolte, Algona. Kansas—H. H. Gill, Hays City, Louisiana—Samuel F. Lawrence, 1247 Oakland Street, Shreveport. Mississippi—George W. Askew, Jr., 211 34th Ave., Meridian. Missouri—J. F. Peters, Room 210 Union Station, St. Louis. New York—Louis R. Murray, 927 Ford Street, Ogdensburg. Oregon—F. L. Derby, La Fayette, Texas—Emmett L. Lovett, care Southern Electric Company of Texas, Wichita Falls. *Album Directors*: Alabama—Richard Hines, Jr., Barton Academy Bldg., Mobile. Colorado—O. E. Aultman, Pleased Bldg., Trinidad. Connecticut—Harry E. Carpenter, 389 Remington Ave., Bridgeport. Florida—Capt. E. S. Coutant, Lock Box 73, Stuart. Georgia—L. O. Surlis, P. O. Box 434, Cuthbert. Idaho—Eugene Clifford, 902 9th Ave., Lewiston. Illinois—George A. Price, Box 286, Champaign. Iowa—C. W. Parker, Mapleton. Maryland—E. G. Hooper, 218 East 20th Street, Baltimore. Massachusetts—John Mardon, 10 High Street, Boston. Michigan—W. E. Ziegenfuss, M. D., 171 Richton St., Detroit. Minnesota—Leonard A. Williams, 622 2nd Avenue South, St. Cloud. Mississippi—George W. Askew, Jr., 211 34th Ave., Meridian. Missouri—Wharton Schooler, R. F. D. No. 2, Eolia. New York—Charles F. Rice, P. O. Box 517, Mamaroneck. North Dakota—Jas. A. Van Kleeck, 619 Second Ave., North Fargo. Ohio—J. H. Winchell, R. F. D. No. 2, Painesville. Pennsylvania—L. A. Sneary, 2822 Espy Ave., Pittsburgh. South Dakota—C. B. Bolles, L. B., 351, Aberdeen. Texas—J. B. Oheim, P. O. Drawer M. Henrietta. Utah—John C. Swenson, A. B. Provo. West Virginia—William E. Monroe, Box 298, Point Pleasant.
- KANSAS CITY CAMERA CLUB**, 1919-1920—Suite 501, Bryant Building, Kansas City, Mo. Organized 1914. Club meets second Monday of each month. Annual exhibition in November. *President*, J. G. Sarvent; *Vice-President*, Val. B. Mintun; *Secretary-Treasurer*, Dr. Maclay Lyon. Member Associated Camera Clubs of America.
- KODAK PARK CAMERA CLUB**—Kodak Park, Rochester, N. Y. Organized Jan. 6, 1920. Meetings held bi-monthly. *President*, Alfred Hargreave; *Vice-President*, Karl Gruppe; *Secretary*, G. Harold Hudson, Kodak Park; *Treasurer*, Miss Edna Pownall. Member Associated Camera Clubs of America.
- LOWELL Y. M. C. A. CAMERA CLUB**—Lowell, Mass. *Secretary*, N. R. Farnum.
- MILWAUKEE CAMERA CLUB**—Milwaukee, Wis. Organized January, 1921. Meets every second and fourth Tuesdays of each month. Meetings held in the trustee's room, Milwaukee Public Museum. *President*, B. C. Demium; *Vice-President*, John H. Becker; *Secretary-Treasurer*, Albert Goerlitz, 749 27th Street.
- MOLINE Y. M. C. A. CAMERA CLUB**—Headquarters, Moline, Ill.

- MONTREAL AMATEUR ATHLETIC ASSOCIATION CAMERA CLUB**—Montreal, Canada. Headquarters, M. A. A. A. Building, 250 Peel Street. Organized May 1, 1906. *President*, Gordon K. Miller; *Vice-President*, Walter G. D. Boronow; *Treasurer*, R. E. Melville; *Hon. Secretary*, P. F. Calcutt. Exhibitions: Annual, April; Local, November.
- NEWARK CAMERA CLUB, INC.**—27 Franklin Street, Newark, N. J. Organized 1888. Incorporated 1910. Meetings, second and fourth Mondays in each month. Motto, "SOMETHING OF INTEREST EVERY MONDAY NIGHT." *President*, J. Raymond Boyle; *Vice-President*, Charles Knapp; *Secretary*, Edwin Wick; *Treasurer*, Henry C. Brewster. Membership now 200 active. Member and organizer of Associated Camera Clubs of America. Visitors Welcome.
- NEW BRITAIN CAMERA CLUB**—Organized 1892. *President*, W. B. Rossberg; *Vice-President*, E. H. Start; *Secretary-Treasurer*, Paul A. Stahl, 260 Corbin Avenue, New Britain, Conn. Meets first and third Tuesdays, 173 Main Street. Member Associated Camera Clubs of America.
- NEW HAVEN CAMERA CLUB**—17 Broadway. Organized 1911. Membership, 41. *President*, Frank R. Lawrence; *Vice-President*, Paul B. Hunt; *Secretary-Treasurer*, William R. Frisbie, 172 Norton St., New Haven, Conn. Meetings held every Thursday. Business meetings, First Thursday in the month. Member Associated Camera Clubs of America.
- ORANGE CAMERA CLUB**—East Orange, N. J. Headquarters, Main and Clinton Streets. Established March 21, 1892. Incorporated May 19, 1893. Membership, 115. Date of meetings, first and third Saturdays of each month, except July, August and September. *President*, Robert M. Crater; *Secretary*, Ernest Williams, Main and Clinton Streets, East Orange N. J.
- OREGON CAMERA CLUB**—Portland, Oregon. Headquarters, Fifth Floor Elks' Building. Established 1895. Incorporated 1903. Membership, 100. Meetings first and last Wednesday of each month. *President*, E. C. Churchill; *Secretary*, C. W. Bernhardt. Date of annual exhibit, early in spring. Member Associated Camera Clubs of America.
- PHOTOGRAPHIC CLUB OF BALTIMORE CITY**—Baltimore, Md. Headquarters, 329 Park Avenue. Established 1885. Incorporated 1890. Membership, active, 60. Meetings, first Tuesday in month. *President*, A. Gustafson, Baltimore; *Vice-President*, Percy M. Reese; *Secretary*, A. H. Goldsborough, Baltimore. Member Associated Camera Clubs of America.
- PHOTO FELLOWS CLUB**—Vancouver, Canada. Headquarters, 650 Granville Street. *Secretary-Treasurer*, Lieut. J. Green, R. N. V. R.
- PHOTOGRAPHIC SOCIETY OF PHILADELPHIA**—Philadelphia, Pa. Headquarters, 1615-1617 Sansom Street. Established November, 1862. Incorporated April 24, 1885. Membership, 100. Date of meetings: Members, second Wednesday. *President*, William W. Chambers; *Secretary*, E. A. McKinley, 1615 Sansom Street; *Treasurer*, H. F. A. Starr. Date of members' annual exhibition, March. Member Associated Camera Clubs of America.
- PICTORIAL PHOTOGRAPHERS OF AMERICA**—New York City. Headquarters, Art Center, 65 East 56th Street. Meetings first Monday evening in each month from October to June. *President*, Dr. A. D. Chaffee; *Vice-President*, John Paul Edwards; *Hon. Vice-Presidents*, Gertrude Kasebier, Prof. Charles F. Chandler, Clarence H. White; *Treasurer*, S. Louisa Lauffer; *Recording Secretary*, Wm. A. Alcock; *Corresponding Secretary*, Joseph R. Mason. Member Associated Camera Clubs of America.
- PHOTO PICTORIALISTS OF CINCINNATI**—Cincinnati, Ohio. Organized, 1920. Work devoted to advancement of pictorial photography. Membership, six. Meetings on call only. Chas H. Partington, director; G. A. Ginter, Robt. P. Nute, Chas. A. Weddigen, Harry W. Green, Peter Scherrer. Address communications to the director, 4113 Thirty-second Street.
- PICTORIAL PHOTOGRAPHIC SOCIETY OF SAN FRANCISCO, CAL.**—*Director*, Anson Herrick; *Vice-Director*, L. Goetz; *Secretary-Treasurer*, Percy Neymann, Ph.D., 45 Stockton St., San Francisco; *Secretary Salon Committee*, H. A. Hussey, 64 Pine St., San Francisco.
- PITTSBURGH ACADEMY OF SCIENCE AND ART (PHOTOGRAPHIC SECTION)**—Pittsburgh, Pa. Headquarters, Carnegie Institute, Schenley Park. Organized January 23, 1900. Membership, 100. Meetings, second and fourth Tuesdays in each month at Carnegie Institute. *President*, O. C. Reiter, 2424 Penn Avenue; *Vice-President*, N. S. Woodbridge; *Secretary-Treasurer*, Chas. K. Archer, 1412 Carnegie Bldg., Pittsburgh, Pa.; *Lantern-Slide Director*, P. F. Squier; *Print Director*, S. A. Martin. Annual salon, Carnegie Art Gallery, March. Address all communications to Chas. K. Archer, Secretary, 1412 Carnegie Bldg., Pittsburgh, Pa.
- PITTSBURGH PHOTOGRAPHIC SOCIETY**—Pittsburgh, Pa. Headquarters, North Side Community House. Established June, 1921. Membership, 25. *President*, Charles W. Douth; *Secretary*, John Allen; *Treasurer*, M. P. Beers.

- PITTSBURGH SALON OF PHOTOGRAPHIC ART**—Pittsburgh, Pa. Under auspices of Photographic Section of the Academy of Science and Art. Membership consists of the leading pictorialists in the United States. *President*, O. C. Reiter, 2424 Penn Avenue, Pittsburgh, Pa.; *Secretary*, Charles K. Archer, 1412 Carnegie Bldg., Pittsburgh, Pa. Salon held Carnegie Institute March. Last day of entry, February 7th.
- POLYTECHNIC CAMERA CLUB**—Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Organized May 15, 1921. Meets second and fourth Tuesdays, 12.30 p. m. *President*, Joseph R. Fisher, 1555 74th St.; *Secretary*, Edward Breiteirser, 2703 Bainbridge Ave., Bronx, N. Y.
- PORTLAND CAMERA CLUB PHOTOGRAPHIC SECTION OF THE PORTLAND SOCIETY OF ART**—Portland, Me. Headquarters, L. D. M. Sweat Memorial, Spring corner High Street. Established 1899. Membership, 105. Date of meetings every Monday evening. *President* Alfred Brinkler; *Vice-President*, H. A. Peabody; *Secretary-Treasurer*, C. M. Jaquith, 515 Congress St. Date of annual exhibition, in March. Member Associated Camera Clubs of America.
- POSTAL PHOTOGRAPHIC CLUB**—Headquarters, Washington, D. C. Established December, 1888. Membership, 40. Date of meetings, no regular meeting. *President*, Charles E. Fairman; *Secretary*, Ernest L. Crandall, 1331 Newton Street, N. E., Brookland, Washington D. C. Albums circulate among members monthly, except August and September.
- READING CAMERA CLUB**—Reading, Pa. Headquarters, 610 Court St. Established 1913. Meetings first and third Thursdays of each month. Quarterly exhibits for members only. Annual exhibit early in March. *President*, Dr. Frederick Willson; *Secretary*, L. Roy Frey, 922 Hamilton Place, Wyomissing, Pa. Member Associated Camera Clubs of America.
- SAN DIEGO Y. M. C. A. CAMERA CLUB**—San Diego, Cal. Organized January, 1920. Headquarters, Y. M. C. A., San Diego, Cal. *President*, Harold A. Taylor; *Vice-President*, Ivor N. Lawson, Jr.; *Secretary-Treasurer*, Homer C. Miller. Annual exhibition in May. Member Associated Camera Clubs of America.
- SOUTHERN CALIFORNIA CAMERA CLUB**—213 Columbia Bldg., 313 W. 3rd St., Los Angeles. Membership 120. *President*, W. C. Sawyer; *Vice-President*, C. Williams; *Secretary*, R. L. van Oosting; *Treasurer*, (Miss) Maud Robertson. Meetings every Thursday night. Course in Photography. Both open to the public. Membership Associated Camera Clubs of America. Send notices, public exhibitions, contests and salons.
- ST. LOUIS CAMERA CLUB**—St. Louis, Mo. Organized February 12, 1914. Devoted to the interest and advancement of the art of photography. Meetings every first and third Thursdays at 8 p. m., Barr Branch Library, Jefferson and Lafayette Aves. *President*, John D. Pursell; *Vice-President*, R. L. Jungling; *Secretary*, O. J. White, 1729 California Ave., St. Louis, Mo. Member Associated Camera Clubs of America.
- SWAIN CAMERA CLUB**—New Bedford Mass. *Secretary*, Herbert J. Harper, 95 Walden St.
- TELEPHONE CAMERA CLUB**—Headquarters, 964 Sherman Ave., New York. *Secretary*, W. J. Marshall.
- TRENTON PHOTOGRAPHIC SOCIETY**—Headquarters, 209 East State St., Trenton, N. J.
- UTAH CAMERA CLUB**—Salt Lake City, Utah. *President*, Geo. I. Reeves; *Secretary*, Thomas O. Sheckell, 1411 Walker Bank Bldg.
- WASHINGTON Y. M. C. A. CAMERA CLUB**—Washington, D. C. Headquarters, Central Y. M. C. A. Building. Membership, 32. *President*, Myron F. Myers; *Secretary*, Miss Elizabeth N. Brownley, 908 Que St., N. W.
- WESLEY CAMERA CLUB**—Headquarters, Bell Theatre Building. Organized April 6, 1912. Meeting the first Monday of each month. *President*, Lester Lease; *Vice-President*, H. H. Flom; *Secretary and Treasurer*, W. A. Drewelow, Wesley, Iowa.
- WILKES-BARRE CAMERA CLUB**—Headquarters, 131 South Main St., Wilkes-Barre, Pa. Organized 1901. Meet every Tuesday evening 8 o'clock. *President*, Jos. Hogarth; *First Vice-President*, A. G. Reisser; *Secretary*, A. P. Salyer; *Treasurer*, Albert Williams, Jr. Member Associated Camera Clubs of America.
- YONKERS CAMERA CLUB**—Yonkers, N. Y. Headquarters, 782 Warburton Ave. *President*, W. R. Cronk; *Vice-President*, Wm. Beck; *Secretary*, Elijah F. Munn, 11 Van Cortland Park Ave., Yonkers, N. Y.; *Librarian*, C. B. Carling; *Trustees*, F. W. Wocher, Wm. D. Mitchell, Geo. H. Stengel.



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